IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

September 3, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL DRAFT

December 11, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration

nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On September 3, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 06-025-0007), El Centro (AQS Site Code (06-025-1003), and Westmorland (AQS Site Code 06-025-4003) California, measured exceedances of the National Ambient Air Quality Standard (NAAQS). Both the Federal Reference Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler and the Federal Equivalent Method (FEM), Beta Attenuation Monitors Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 275 µg/m^3, 174 µg/m^3, and 202 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS located in Brawley, El Centro, and Westmorland were the only monitors in Imperial County to measure exceedances of the PM_{10} NAAQS on September 3, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON SEPTEMBER 3, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
9/3/2016	**Brawley**	**06-025-0007**	**1**	**24**	**275**	**150**
9/3/2016	**El Centro**	**06-025-1003**	**4**	**24**	**174**	**150**
9/3/2016	**Westmorland**	**06-025-4003**	**3**	**24**	**202**	**150**
9/3/2016	Brawley	06-025-0007	3	24	119	150
9/3/2016	Calexico	06-025-0005	3	24	97	150
9/3/2016	Niland	06-025-4004	3	24	135	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On September 3, 2016, the Brawley, El Centro, and Westmorland monitors were impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds associated with a trough of low pressure that moved inland through the western states on September 3, 2016.

This report demonstrates that a naturally occurring event caused an exceedance observed on September 3, 2016, which elevated particulate matter and affected air quality. The report

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2015 Pacific Daylight Time (PDT) is March 13 through November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 275 µg/m^3, 174 µg/m^3, and 203 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER).[2]

I.1 Demonstration Contents

Section II - Describes the September 3, 2016 event as it occurred in California and in Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedances at the Brawley, El Centro, and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley, El Centro, and Westmorland monitors this section discusses and establishes how the September 3, 2016 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the September 3, 2016 event and its resulting emissions defining the event as a "natural event".[3]

Section IV - Provides evidence that the event of September 3, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the San Diego and Phoenix NWS synopsis as an extended week-to-weekend notification via the ICAPCD's webpage on Friday, September 2, 2016. The published notice identified a trough of low-pressure over the West with a deep marine layer through Labor Day. The forecast identified locally strong and gusty winds each afternoon and night within the mountains and deserts. Specifically, the identified areas were the San Diego mountain passes, ridgetops, and desert slopes and portions of the deserts. Unfortunately, the Phoenix synopsis, published Friday, September 2, 2016 only identified the decrease of monsoonal moisture levels. Due to the potential for suspended particles and poor air quality, the ICAPCD issued a "Limited Burn" day advisory for Imperial County September 3, 2016. The ICAPCD posted on its website an air quality forecast that an upper level low approaching the region would lead to gusty winds and blowing dust. **Appendix A** contains copies of notices pertinent to the September 3, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley, El Centro, and Westmorland monitors on April 17, 2017. The INPEE, for the September 3, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for September 3, 2016. The submitted request included a brief description of the meteorological conditions for September 3, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on March 12, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 275 µg/m^3, 174 µg/m^3 and 202 µg/m^3 (**Table 1-1**), which occurred on September 3, 2016 in Niland, Brawley, Westmorland and El Centro. The final closing date for comments was April 11, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the September 3, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2017.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on September 3, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event "is not reasonably controllable and not reasonably preventable."
- e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."

f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, El Centro, and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II September 3, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the September 3, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1**).The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

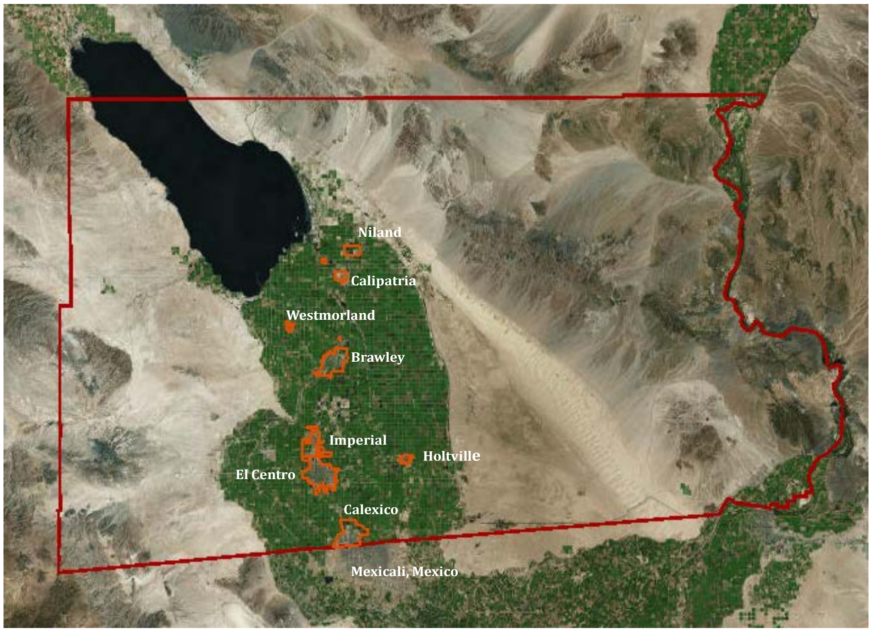


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

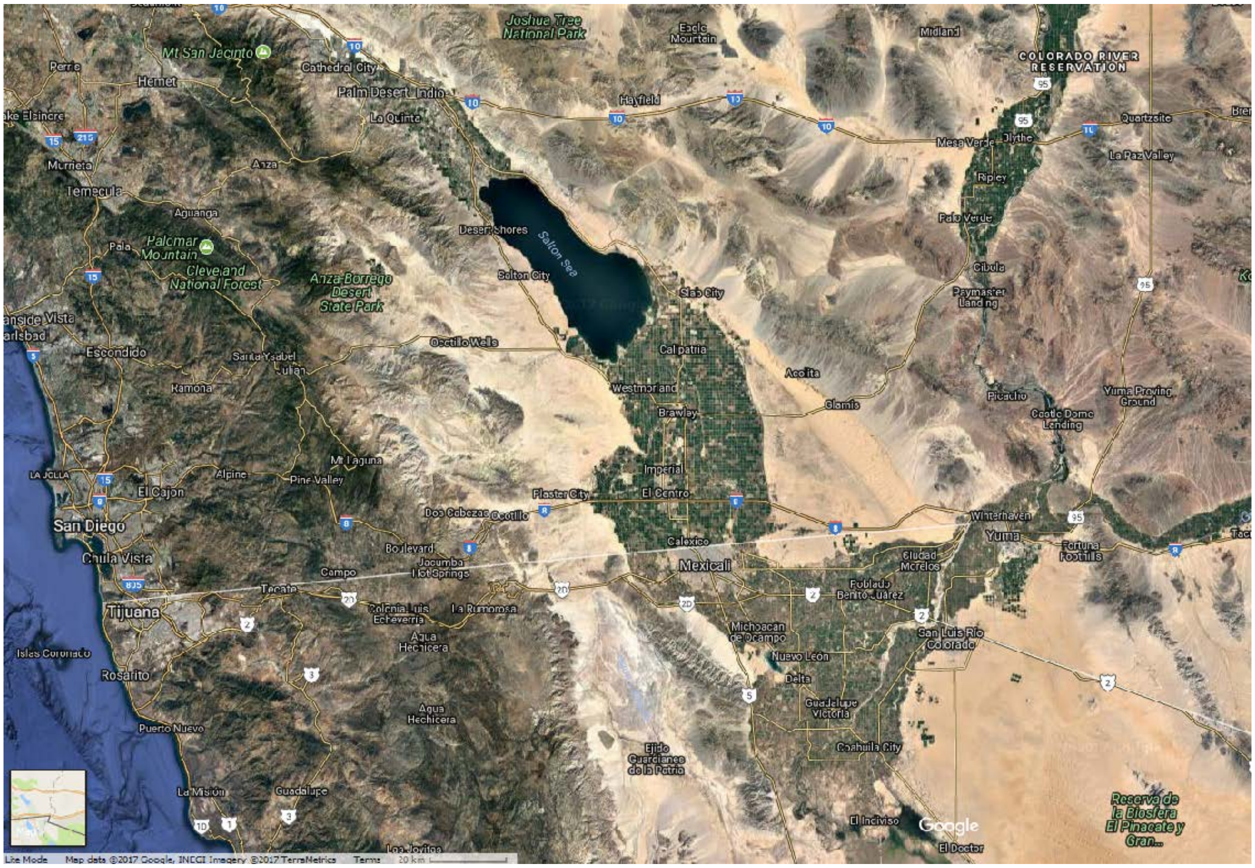


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on September 3, 2016, occurred at the Brawley, El Centro, and Westmorland stations. The Brawley, El Centro, and Westmorland stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on September 3, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

Fig 2-8: Depicts a select group of PM_{10} monitoring sites in Imperial County, eastern Riverside County, and southwestern Arizona (Yuma County). Generated through Google Earth.

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and

115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

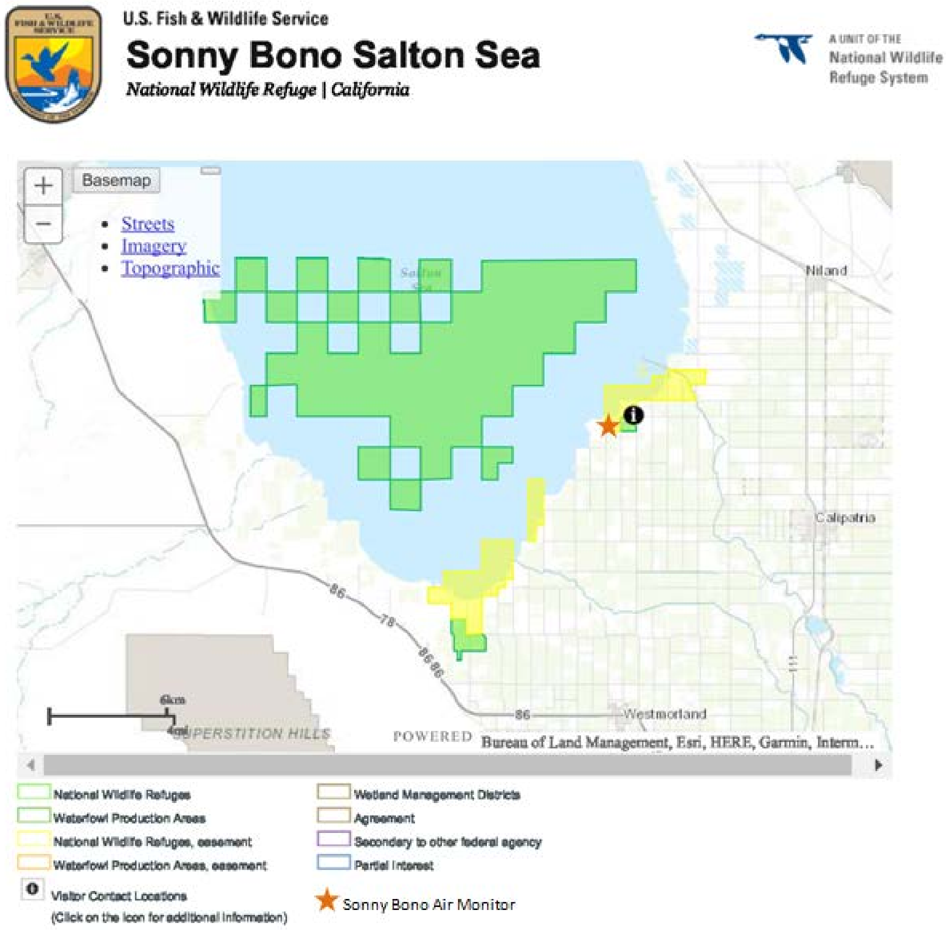


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
SEPTEMBER 3, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} (µg/m³) Avg	1-hr PM_{10} (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	275	-	-	-	-
		BAM 1020					120	946	17:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	98	543	18:00	10.1	20:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	174	858	19:00	16.2	20:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	18.4	18:00
		BAM 1020					98	416	18:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	203	995	17:00	7.7	22:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	43	101	15:00	14	22:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	85	513	20:00	13.9	20:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	73	655	22:00	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

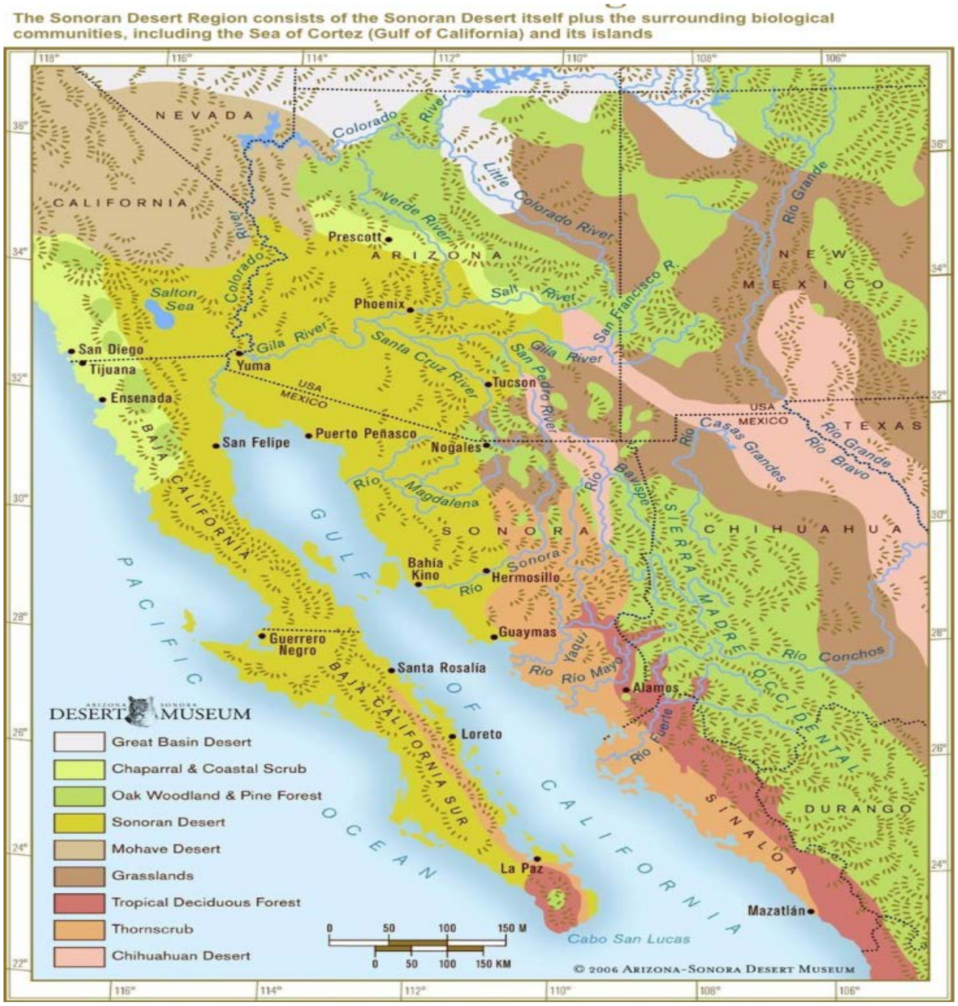


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64” (**Figure 2-16)**. During the 12-month period prior to the September 3, 2016 event, Imperial County measured a total annual precipitation of 0.83 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

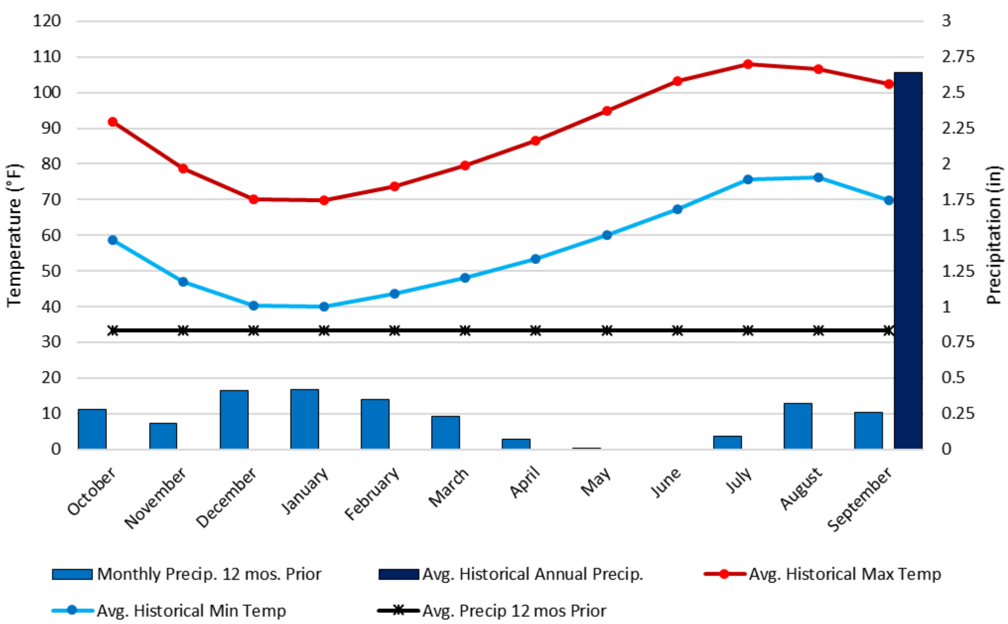


Fig 2-16: Historical Imperial County weather. Prior to September 3, 2016, the region suffered abnormally low total precipitation of 0.83 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front (if applicable), and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for September 3, 2016, which was caused by an upper level trough that deepened the onshore flow as it moved inland over the western states brought dry southwest flow aloft. The deepening of the onshore flow brought gusty southwest to west winds to the mountains and deserts each afternoon and evening within San Diego County. Because the trough of low pressure brought drier southwest flow aloft humidity in the deserts and desert slopes of the mountains fell sufficiently enough to cause the San Diego NWS office to issue six Urgent Weather messages containing Red Flag warnings.[5]

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

[5] A term used by fire-weather forecasters to call attention to limited weather conditions of particular importance that may result in extreme burning conditions. It is issued when it is an on-going event or the fire weather forecaster has a high degree of confidence that Red Flag criteria will occur within 24 hours of issuance. Red Flag criteria occurs whenever a geographical area has been in a dry spell for a week or two, or for a shorter period, if before spring green-up or after fall color, and the National Fire Danger Rating System (NFDRS) is high to extreme and the following forecast weather parameters are forecasted to be met: 1) a sustained wind average 15 mph or greater 2) relative humidity less than or equal to 25 percent and 3) a temperature of greater than 75 degrees F. In some states, dry lightning and unstable air are criterial. A Fire Weather Watch may be issued prior to the Red Flag Warning. http://w1.weather.gov/glossary/index.php?letter=r

Figures 2-17 and 2-18 provide information regarding the upper level trough and the tightening of the surface gradient as the system moved into the region.

FIGURE 2-17
UPPER LEVEL TROUGH MOVES INLAND

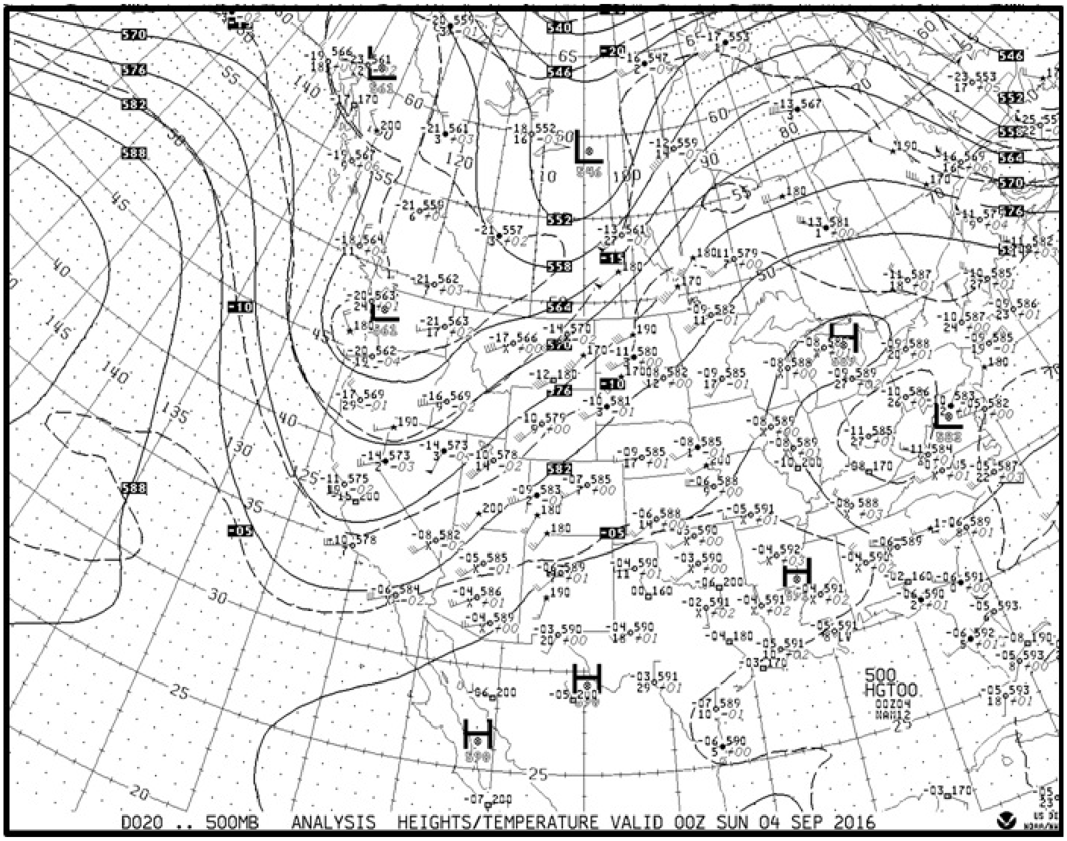


Fig 2-17: The deepening of the upper level low at 1600 PST on September 3, 2016 is coincident with the elevated winds and gusts as measured at local airports. Source: Colorado State University Department of Atmospheric Science; http://archive.atmos.colostate.edu/data/misc/QHTA11/1609

FIGURE 2-18
PACKED SURFACE GRADIENT OVER SOUTHEASTERN CALIFORNIA

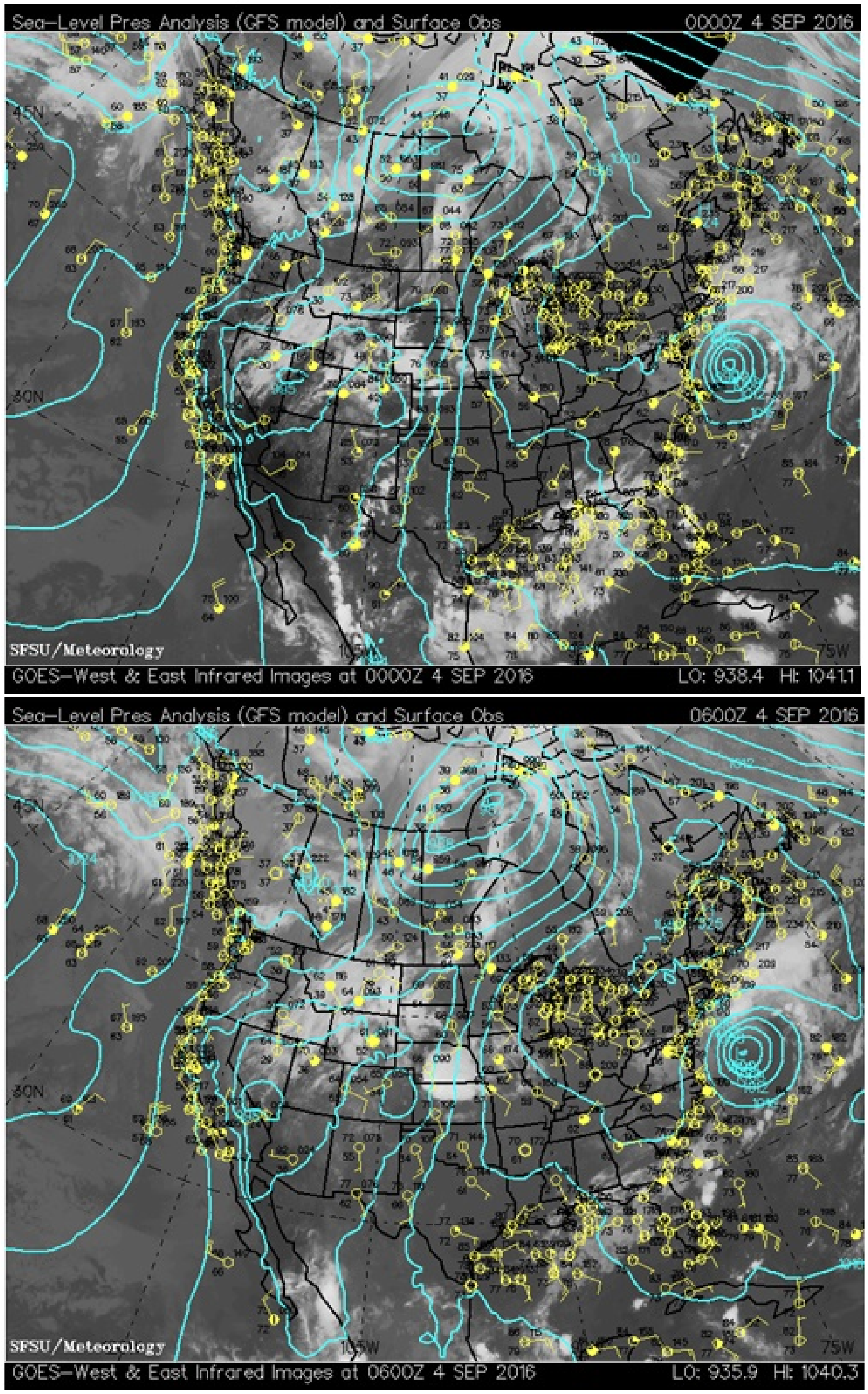


Fig 2-18: Two CONUS infrared images 1600 (top) and 2200 (bottom) PST on September 3, 2016 showing the gradient well-packed at the surface across the mountains of southeastern California. This was during the period when winds picked up across Imperial County. Source: SFSU Department of Earth and Climate Science and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1609

As early as September 1, 2016 the NWS office in San Diego identified an upper-level ridge centered over north-central Mexico stretching up to North Dakota and an upper-level trough stretching from the Northwest Pacific Coast down to central California. The NWS office in Phoenix similarly identified a weak former Mexican trof in southeast Az exiting the state eastward and a fairly deep Pacific low-pressure system moving into the Pacific northwest. Both area forecast discussions identified a resulting change in winds as increasing westerly winds. The upper-level trough was expected to move across California Friday, September 2, 2016 and Saturday, September 3, 2016 creating gusty westerly winds during the afternoon and evening hours over the mountain ridges and along desert mountain slopes and foothills.

As mentioned above, as a result of the forecast analysis by the San Diego NWS office, six Urgent Weather messages were issued which included Red Flag Warnings. The first Urgent Weather message was issued September 2, 2016 with the last Urgent Weather messaged issued September 3, 2016. The Urgent Weather messages forecasted winds 15 to 25mph with gust 30 to 40mph. By 08:39pm PST the San Diego NWS office released a Public Information Statement identifying measured wind speeds of 36mph at Ocotillo Wells. Locally, both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK), measured multiple hours of winds at or above 25mph. **Figure 2-19** is a graphical illustration of the chain of events for September 3, 2016.

FIGURE 2-19
RAMP-UP ANALYSIS SEPTEMBER 3, 2016

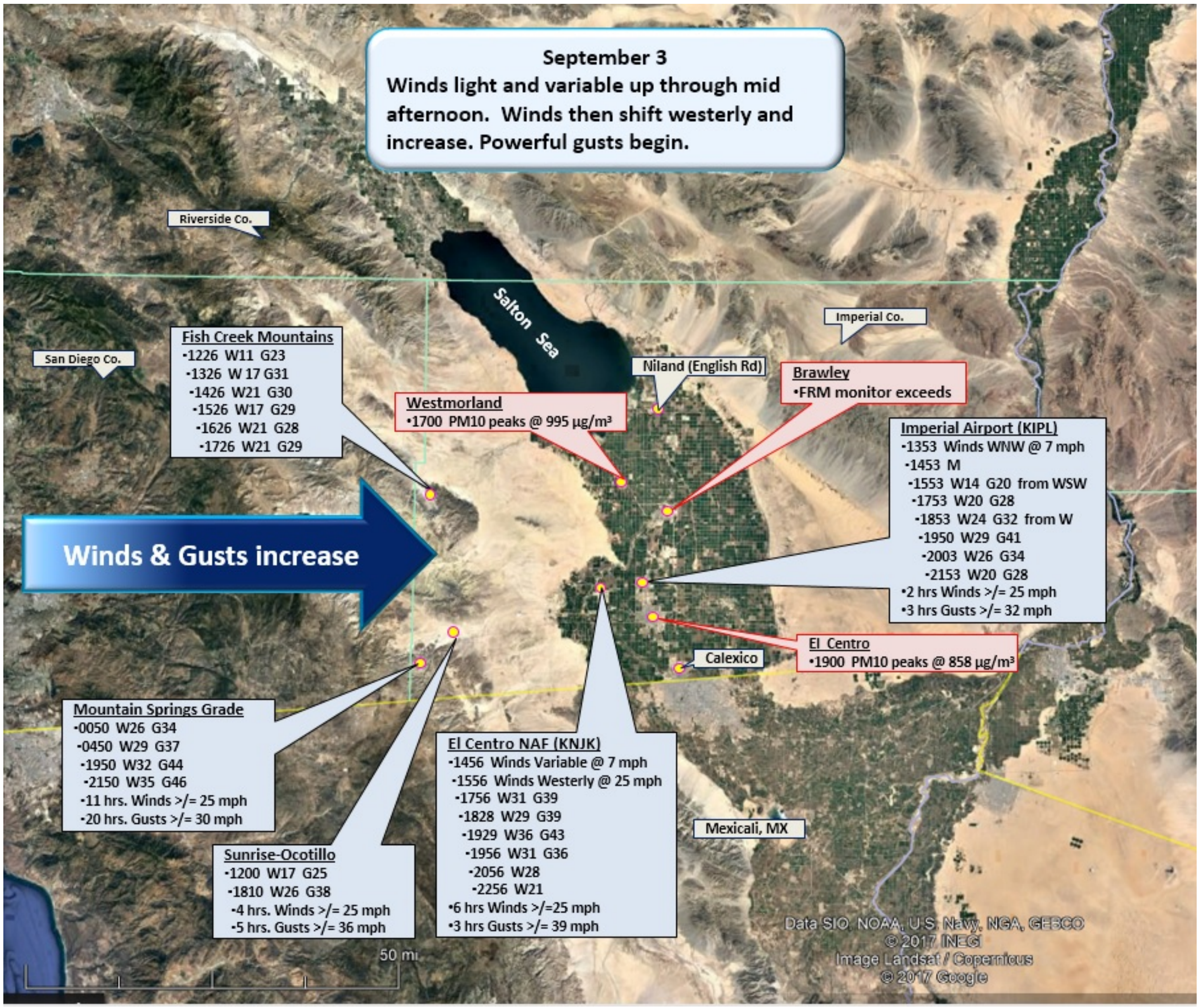


Fig 2-19: As the low-pressure trough deepened gusty westerly winds increased around mid- afternoon. The increase in winds was accompanied by strong gusts. Monitors at Westmorland and El Centro measured peak hourly PM_{10} concentrations by evening. Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON SEPTEMBER 3, 2016

Station Monitor Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM10 correlated to time of Max Wind Speed				
						Brly	Nild	Wstmld	EC	Clx
IMPERIAL COUNTY										
Imperial Airport (KIPL)	29	280	19:50	41	19:50	-	995	768	858	240
Naval Air Facility (KNJK)	36	270	19:29	43	19:29	-	995	768	858	240
Calexico (Ethel St)	10.1	314	20:00	-	-	563	415	267	695	322
El Centro (9th Street)	13.7	273	18:00	-	-	-	416	995	711	543
Niland (English Rd)	18.4	262	18:00	-	-	-	416	995	711	543
Westmorland	11.6	277	22:00	-	-	89	124	153	58	74
RIVERSIDE COUNTY										
Blythe Airport (KBLH)	21	220	21:52	24	16:52	120	92	164	187	169
Palm Springs Airport (KPSP)	25	320	14:53	33	14:53	24	46	24	27	34
Jacqueline Cochran Regional Airport (KTRM) - Thermal	20	340	19:52	28	19:52	-	995	768	858	240
ARIZONA - YUMA										
Yuma MCAS (KNYL)	18	150	17:57	17	13:57	946	133	995	689	229
MEXICALI - MEXICO										
Mexicali Int. Airport (MXL)	15	320	21:48	-	-	120	92	164	187	169

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[6] depicted in **Figure 2-20** depicts the general path of air six hours prior to the 7:00pm PST elevated hourly PM_{10} concentrations measured at the Brawley, El Centro and Westmorland monitors. The trajectory illustrates a typical scenario when west winds (airflow) funnel through the mountain passes, many times increasing in speed, and down the desert slopes of San Diego County onto the valley floor. Strong westerly winds typically blow through these mountain passes and desert slopes entraining PM_{10} across the desert floor and agricultural lands within Imperial County. It is of some worth to point out that from time to time modeled winds differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

[6] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-20
HYSPLIT BACK-TRAJECTORY MODEL

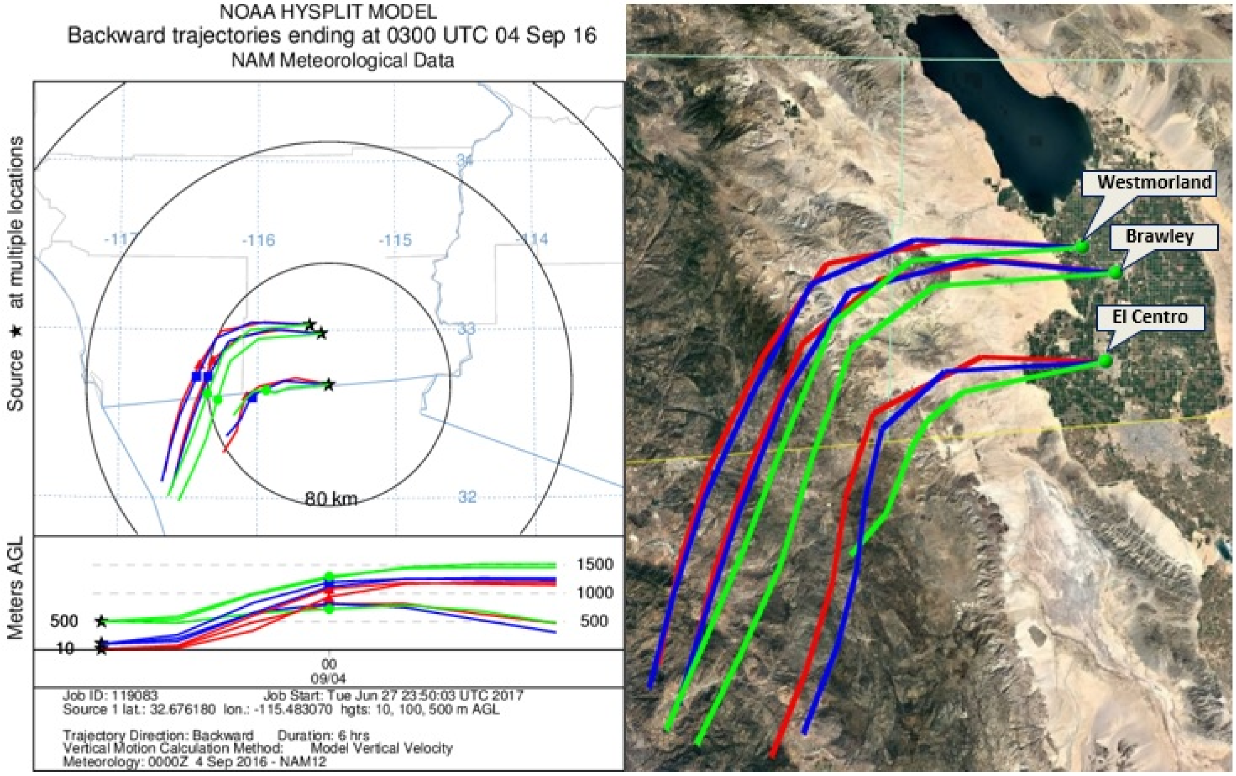


Fig 2-20: 6-hour back-trajectories ending at Brawley, El Centro, and Westmorland at 1900 PST on September 3, 2016 shows that air flowed over the mountain and deserts to the west before reaching the monitors. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-21 and 2-22 illustrate the wind speeds and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma counties for a total three days, September 2, 2016 through September 4, 2016. Elevated emissions entrained into Imperial County affected all the monitors in Imperial County. However, only the Brawley, El Centro, and Westmorland monitors measured an exceedance when gusty westerly winds associated with the strong low-pressure system moved through the region. All monitors in Imperial County measured elevated concentrations of PM_{10} by 16:00 PST coincident with elevated wind speeds and gusts. The Brawley, El Centro, and Westmorland monitors measured the highest elevated concentrations 1600 through 2200 PST on September 3, 2016.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[7] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the September 3, 2016 high, wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-21
72 HOUR WIND SPEEDS AT REGIONAL AIRFIELDS

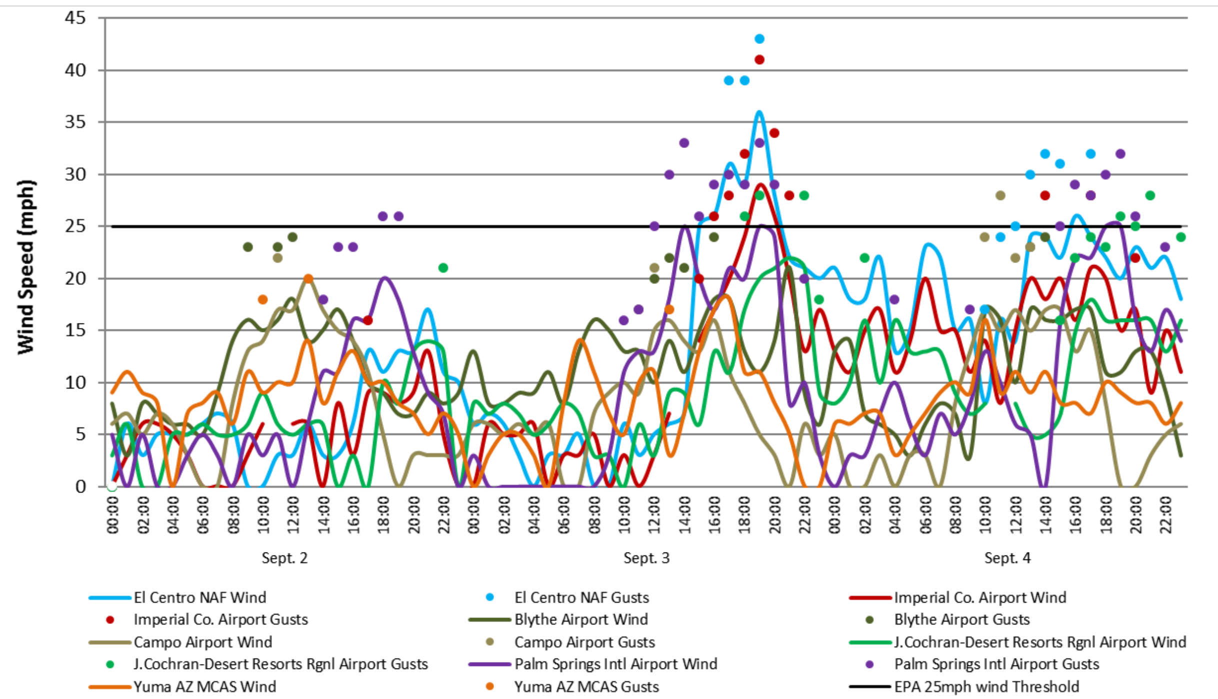


Fig 2-21: Is the graphical representation of the 72 hour measured winds speeds and gusts at regional airports in southeast California and southwestern Arizona. The graph illustrates the significant number of hours where measured wind speeds and wind gusts where above 25 mph. It helps to illustrate the regional nature of the event. Wind Data from the NCEI's QCLCD system

[7] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-22
72 HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

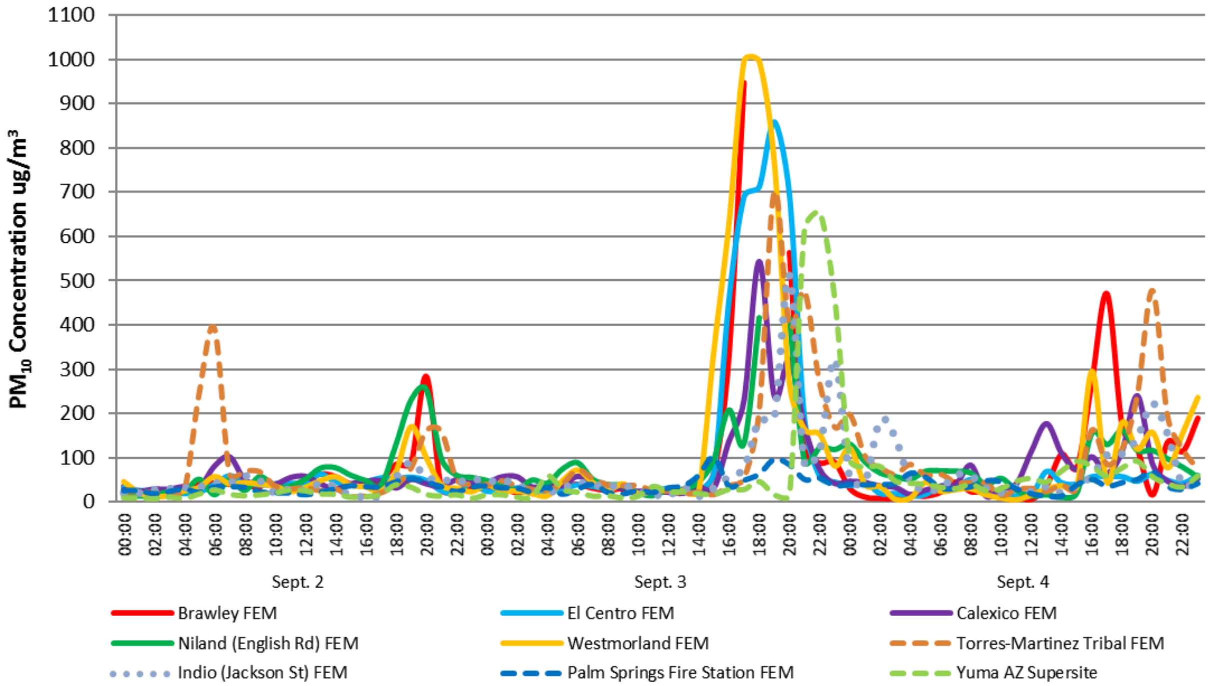


Fig 2-22: Is the graphical representation of the 72 hour relative PM_{10} concentrations at various sites in southeast California and southwestern Arizona. The elevated PM_{10} concentrations at all sites on September 3, 2016 demonstrate the regional affect of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley, El Centro, and Westmorland monitors on September 3, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the September 3, 2016 high wind event and the exceedance measured at the Brawley, El Centro, and Westmorland monitors.

Figures 3-1 through 3-6 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley, El Centro, and Westmorland stations for the period of January 1, 2010 through September 3, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.[8] In order to properly establish the variability of the event as it occurred on September 3, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and September 3, 2016 were compiled and plotted as a time series. All figures illustrate that the exceedance, which occurred on September 3, 2016 were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

[8] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO SEPTEMBER 3, 2016

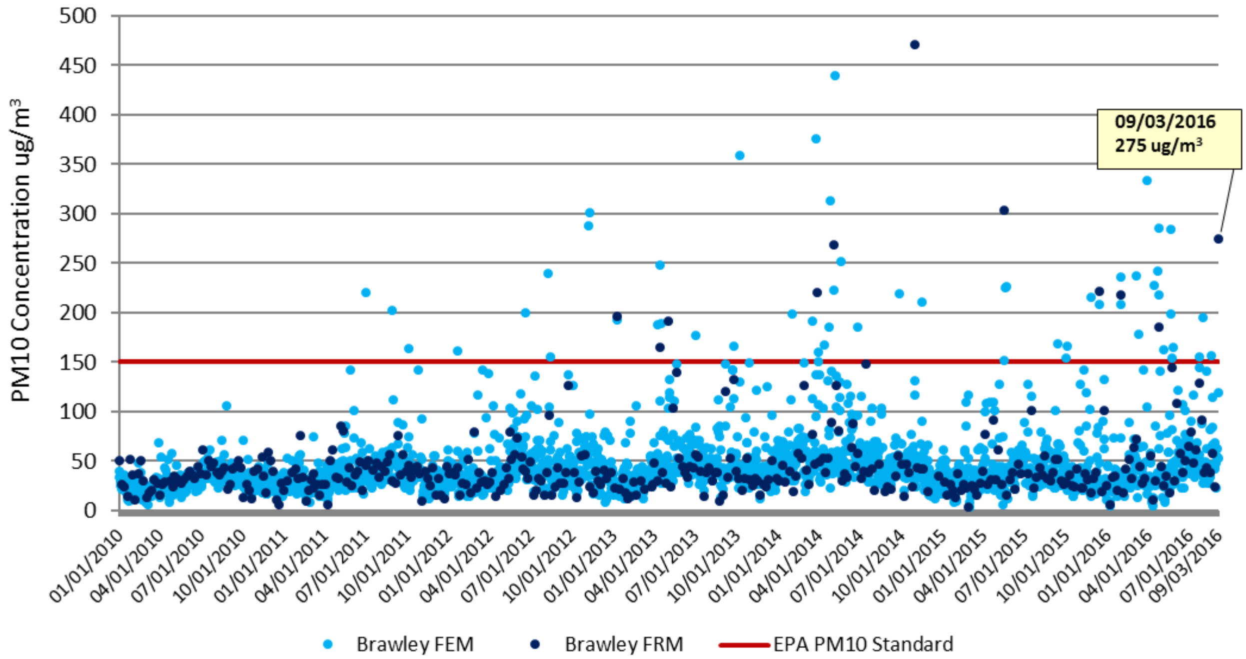


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 275 µg/m^3 on September 3, 2016 by the Brawley monitor was outside the normal historical measurements when compared to similar event days and non-event days

FIGURE 3-2
EL CENTRO HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO SEPTEMBER 3, 2016

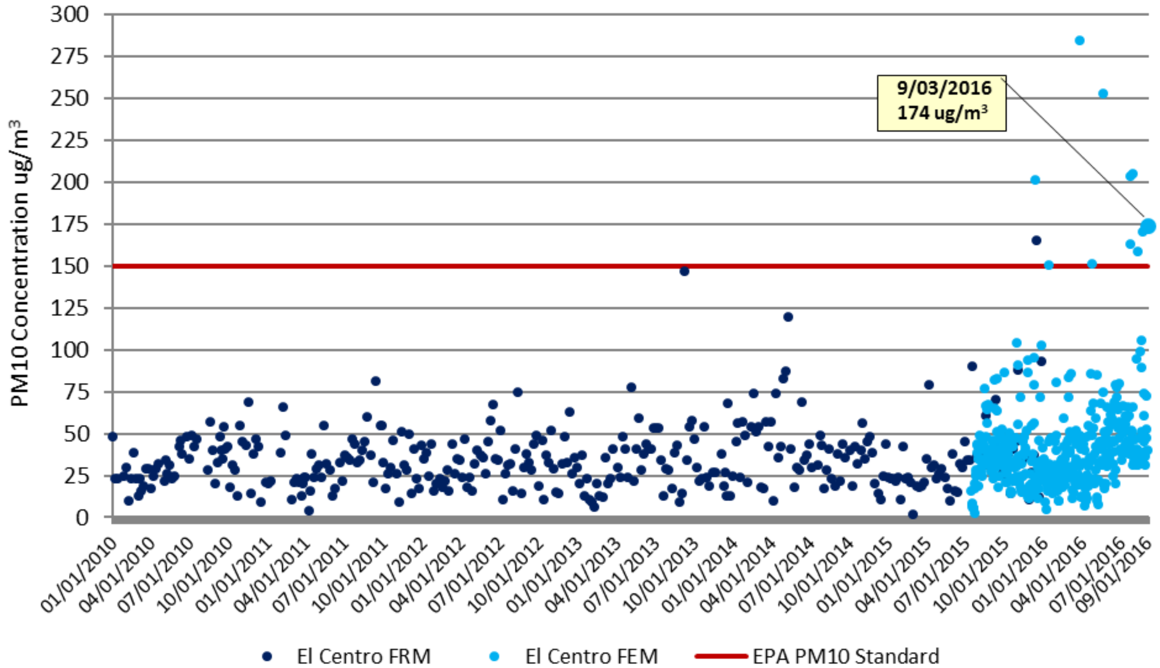


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 174 µg/m³ on September 3, 2016 by the El Centro monitor was outside the normal historical measurements when compared to similar event days and non-event days

FIGURE 3-3
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO SEPTEMBER 3, 2016

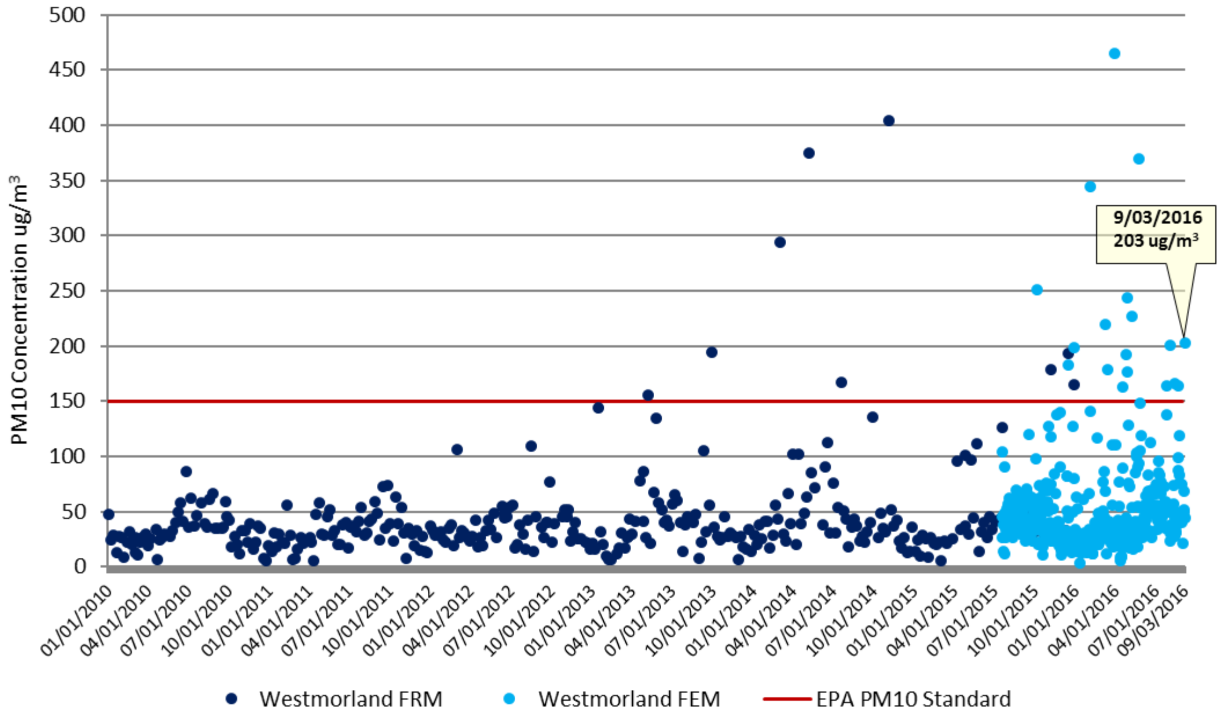
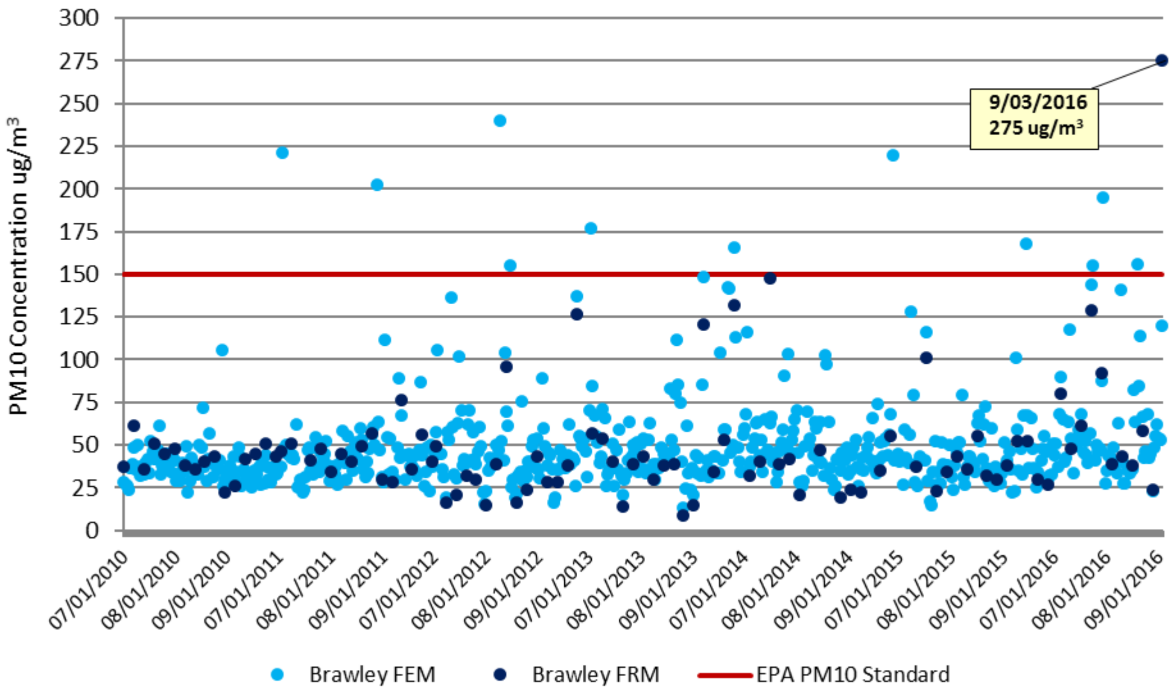


Fig 3-3: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 203 µg/m^3 on September 3,2016 by the Westmorland monitor was outside the normal historical measurements when compared to similar event days and non-event days

The time series, **Figures 3-1 through 3-3** for Brawley, El Centro, and Westmorland included 2,438 sampling days (January 1, 2010 through September 3, 2016). During this period the Brawley station (**Figure 3-1**) recorded 2,554 credible samples measured by either FRM or FEM monitors between January 1, 2010 and September 3, 2016.

Overall, the time series illustrates that of the 2,554 credible samples measured during there was a total of 55 exceedance days, which is a 2.2% occurrence rate. El Centro (**Figure 3-2**) recorded 771 credible samples measured by either FRM or FEM monitors during this period (FEM sampling commenced in July 2015) during which the station recorded nine exceedance days. This translates into 1.2% of all samples. Westmorland (**Figure 3-3**) recorded 773 credible samples measured by either FRM or FEM monitors during this period (FEM sampling began in July 2015) and recorded 25 exceedance days. This equates to 3.2% of all samples. Clearly, exceedances by any of the monitoring stations over a historical period is a rare event.

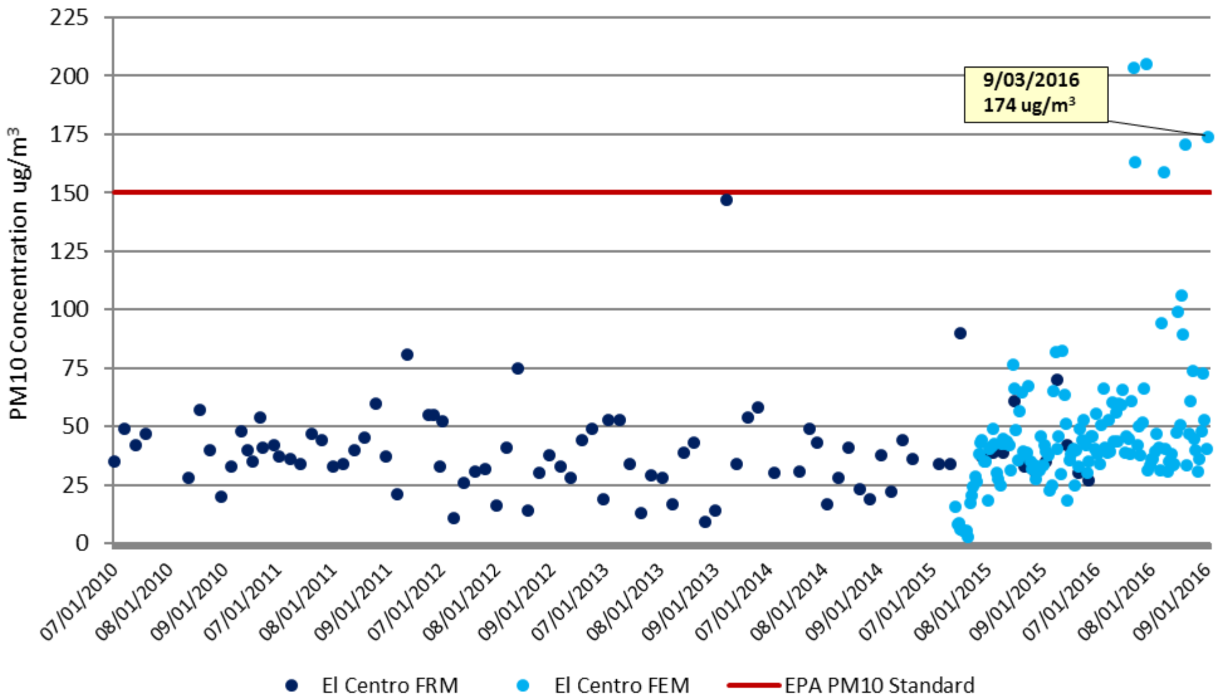
FIGURE 3-4
BRAWLEY SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 03, 2016**



***July 1, 2010 to September 30, 2015 and July 1, 2016 to September 3, 2016**

Fig 3-4: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 275 µg/m^3 on September 3, 2016 by the Brawley monitor was outside the normal seasonal concentrations when compared to similar days and non-event days

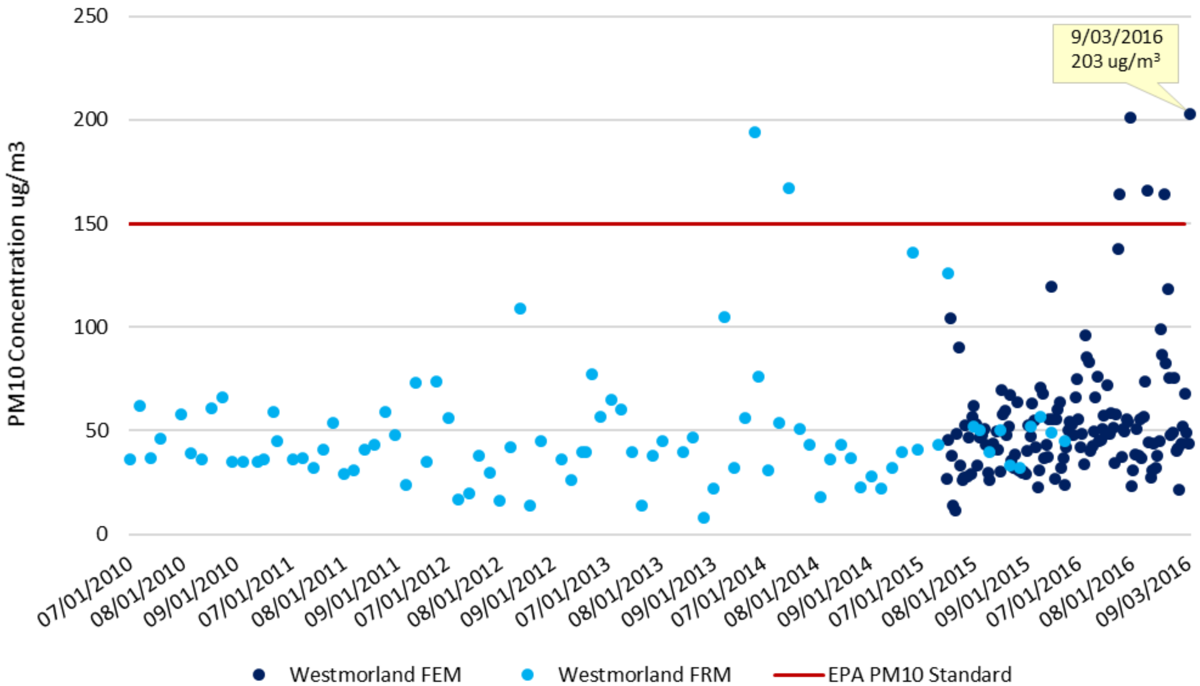
FIGURE 3-5
EL CENTRO SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 03, 2016**



***July 1, 2010 to September 30, 2015 and July 1, 2016 to September 3, 2016**

Fig 3-5: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 174 µg/m^3 on September 3 on by the El Centro BAM 1020 PM_{10} monitor was outside the normal seasonal concentrations when compared to similar days and non-event days.

FIGURE 3-6
EL CENTRO SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
***JULY 1, 2010 THROUGH SEPTEMBER 03, 2016**



***July 1, 2010 to September 30, 2015 and July 1, 2016 to September 3, 2016**

Fig 3-6: A comparison of PM_{10} historical concentrations demonstrates that the measured concentrations of 203 µg/m^3 on September 3, 2016 by the Westmorland monitor was outside the normal seasonal concentrations when compared to similar days and non-event days

Figures 3-4 through 3-6 display the seasonal fluctuations over 617 sampling days at the Brawley, El Centro, and Westmorland stations for months July through September of years 2010 through 2016 (2016 ending September 3). The seasonal sampling period for Brawley (**Figure 3-5**) contains 715 combined FRM and FEM samples. Of these, 11 exceedances occurred during the third quarter which translates into 1.5% of all samples. The seasonal sampling period for El Centro (**Figure 3-6**) [9] contains 232 credible samples and only six exceedance days. This translates into 2.6% of all samples. The seasonal sampling period for Westmorland station (**Figure 3-8**)[10] contains 232 credible samples and seven exceedance days, or 3.0% of all samples.

[9] FEM sampling at the El Centro site began July 2015 therefore January is the only seasonal first-quarter data available.
[10] FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

Figures 3-7 through 3-9 display percentile rankings for Brawley, El Centro, and Westmorland over the historical period of January 2010 through September 3, 2016.

FIGURE 3-7
BRAWLEY HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH SEPTEMBER 3, 2016

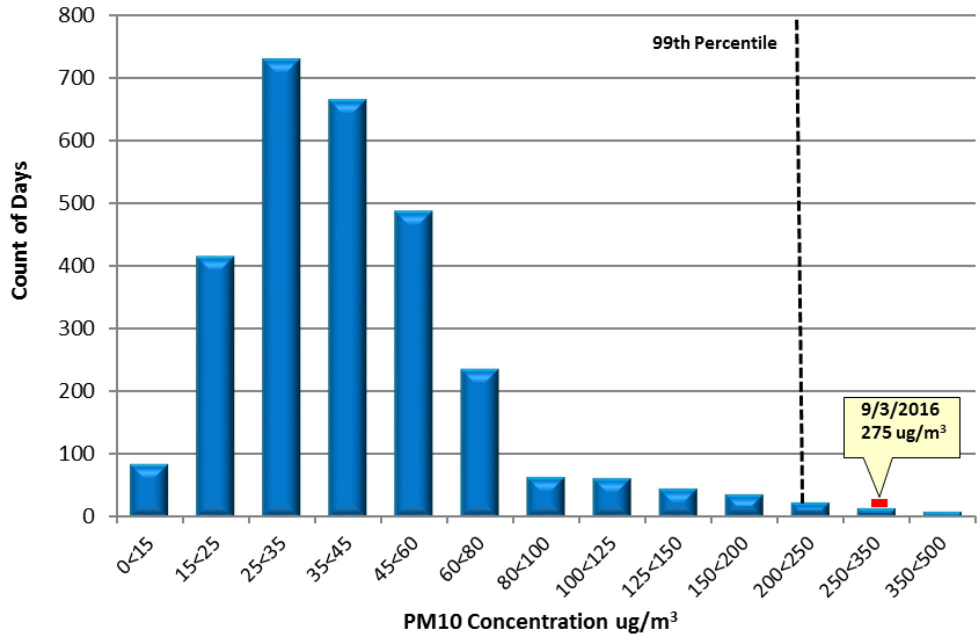


Fig 3-7: The 24-hr average PM_{10} concentration at the Calexico monitoring site demonstrates that the concentration of 275 µg/m^3 on September 3, 2016 2016 was in excess of the 99th percentile

FIGURE 3-8
EL CENTRO HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH SEPTEMBER 3, 2016

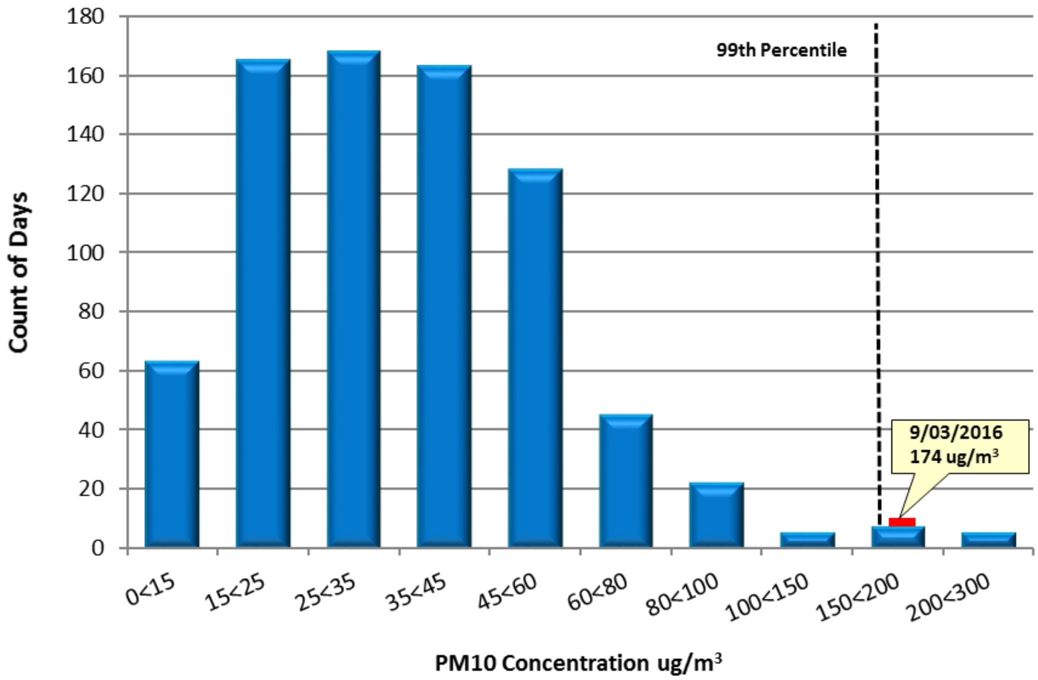


Fig 3-8: The 24-hr average PM_{10} concentration at the El Centro monitoring site demonstrates that the concentration of 174 µg/m^3 on September 3, 2016 was in excess of the 99th percentile

FIGURE 3-9
WESTMORLAND HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH SEPTEMBER 3, 2016

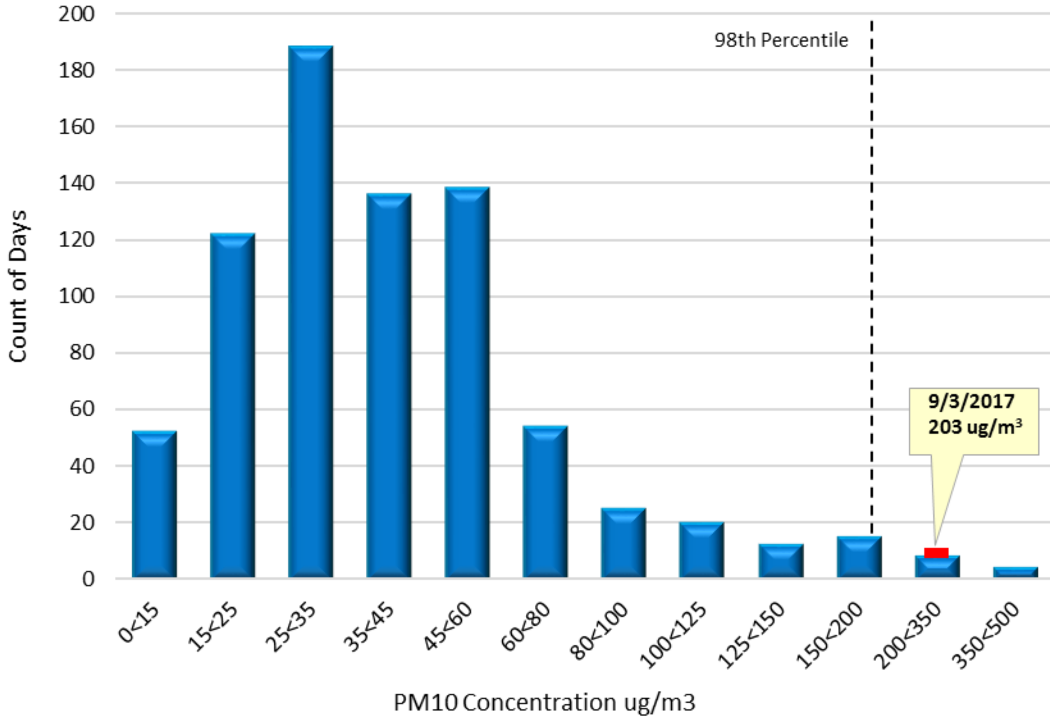


Fig 3-9: The 24-hr average PM_{10} concentration at the Westmorland monitoring site demonstrates that the concentration of 203 µg/m^3 on September 3, 2016 fell on the 98th percentile

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM_{10} concentrations of 275 µg/m^3 and 174 µg/m^3 at Brawley and El Centro are all above the 99th percentile ranking, while the concentration 203 µg/m^3 at Westmorland was in excess of the 98th percentile. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for the historical patterns, the September 3, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on September 3, 2016 occurs infrequently. When comparing the measured PM_{10} levels on September 3, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, El Centro, and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the September 3, 2016 natural event affected the concentrations levels at the Brawley, El Centro, and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on September 3, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the “not reasonably controllable or preventable” (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for “high wind events” when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a “natural event” where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for September 3, 2016. In addition, this September 3, 2016, demonstration provides technical and non-technical evidence that strong and gusty southerly winds blew across portions of the Sonoran Desert to the west and into Imperial County suspending particulate matter affecting the Brawley, El Centro, and Westmorland monitors on September 3, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the September 3, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

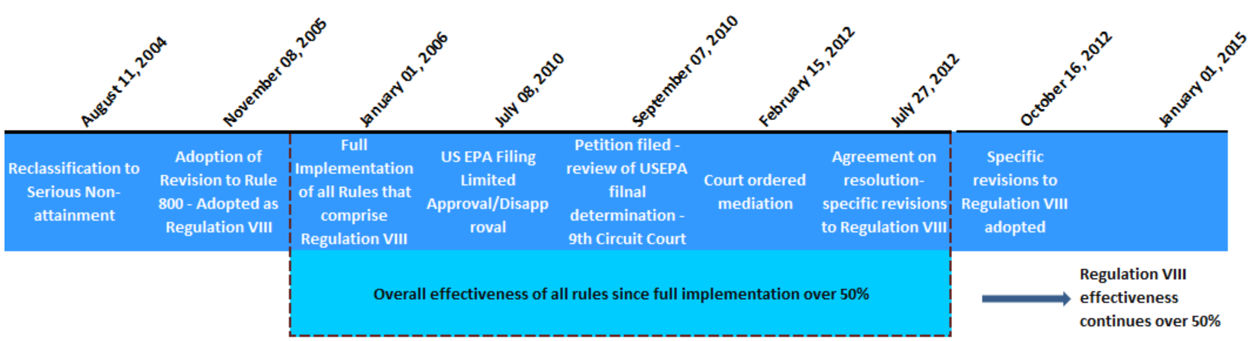


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On September 3, 2016 the ICAPCD declared a Limited Burn day **(Appendix A).** No complaints were filed for agricultural burning on September 3, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Brawley, El Centro, and Westmorland during the September 3, 2016 PM_{10} exceedances. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. September 3, 2016 was officially designated as a Limited Burn day. No complaints were filed on September 3, 2016 related either to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

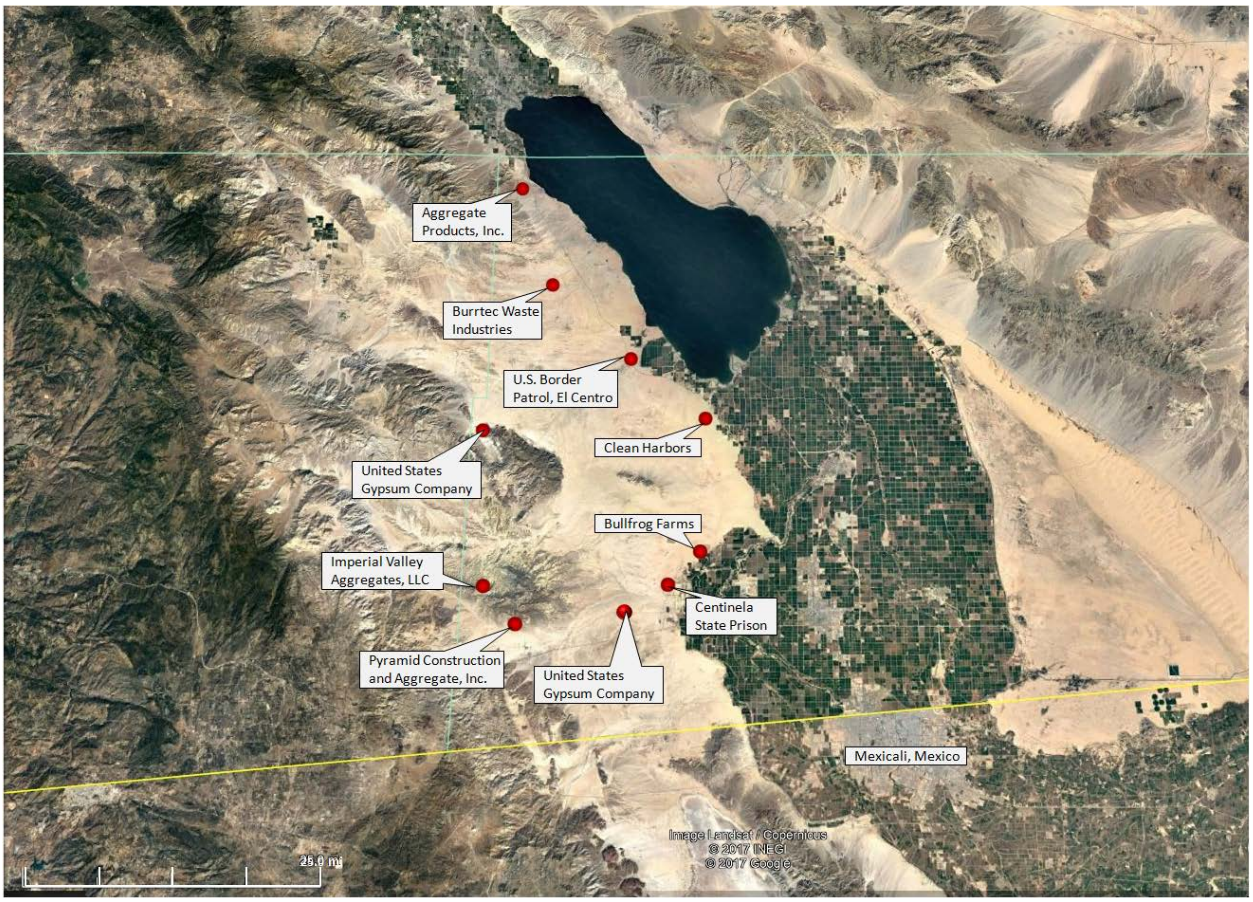


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley, El Centro and Westmorland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, the desert areas are managed either by the Bureau of Land Management or the California Department of Parks. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

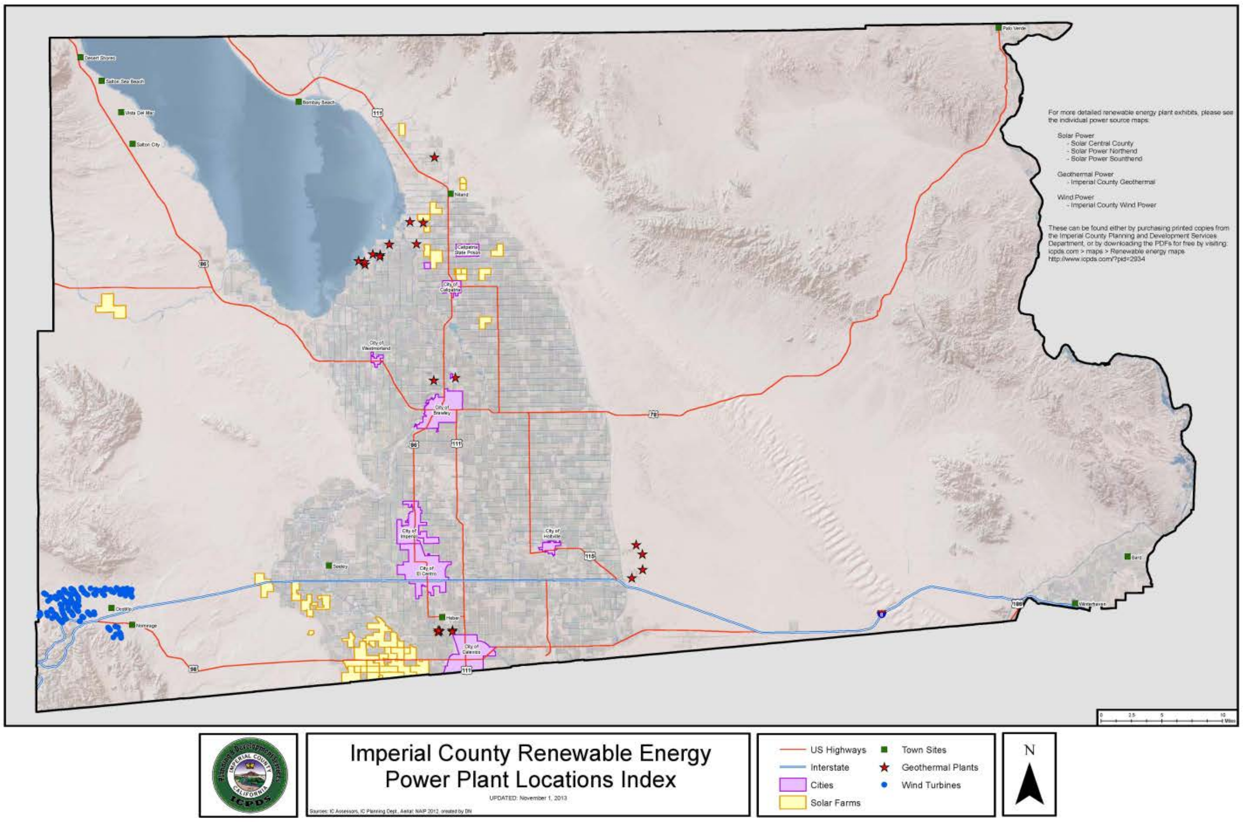


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley, El Centro, and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

As early as 1:25pm and 2:29pm PST on September 1, 2016, the Phoenix and San Diego NWS offices identified a fairly deep Pacific low-pressure trough that was expected to move slowly across the region Friday through the weekend. By Friday, September 2, 2016 the ICAPCD published the San Diego and Phoenix NWS synopsis as an extended week-to-weekend notification via the ICAPCD's webpage. The published notice identified a trough of low-pressure moving over the West with a deep marine layer through Labor Day. The forecast identified locally strong and gusty winds each afternoon and night within the San Diego mountain passes, ridgetops, and desert slopes and portions of the deserts.

As mentioned above, as a result of the forecast analysis by the San Diego NWS office, six Urgent Weather messages were issued which included Red Flag Warnings. The first Urgent Weather message was issued September 2, 2016 with the last Urgent Weather messaged issued September 3, 2016. The Urgent Weather messages forecasted winds 15 to 25mph with gust 30 to 40mph. By 08:39pm PST the San Diego NWS office released a Public Information Statement identifying measured wind speeds of 36mph at Ocotillo Wells. **Appendix A** contains copies of notices pertinent to the September 3, 2016 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Data were also collected from automated meteorological instruments that were upstream from the Brawley, El Centro, and Westmorland monitors during the wind event. On September 3, 2016 the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) measured winds at or above 25 mph for multiple hours. Automated instruments at upstream locations such as Mountain Springs Grade, Sunrise-Ocotillo, and the Fish Creek Mountains also measured winds at or above 25 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the September 3, 2016 event wind speeds were at or above the 25mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds associated with the movement of a low-pressure trough through the region entrained particulate matter that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of Brawley, El Centro, and Westmorland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 43 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on September 3, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The September 3, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for September 3, 2016 identified an upper level trough that moved over the western states bringing dry southwest flow aloft and deepening of the onshore flow. The deepening of the onshore flow brought gusty southwest to west winds to the mountains and deserts each afternoon and evening within San Diego County.

Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley, El Centro, and Westmorland monitors, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations on September 3, 2016. Because the trough of low pressure brought drier southwest flow aloft humidity in the deserts and desert slopes of the mountains fell sufficiently enough to cause the San Diego NWS office to issue six Urgent Weather messages containing Red Flag warnings. As discussed above, the Urgent Weather messages forecasted winds 15 to 25mph with gust 30 to 40mph. By 08:39pm PST the San Diego NWS office released a Public Information Statement identifying elevated measured wind speeds of 36mph at Ocotillo Wells. Locally, both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK), measured multiple hours of winds at or above 25mph.

Figures 5-1 and Figure 5-2 are satellite images of the tightening of the surface gradient during key periods on September 3, 2016 and the forecasted wind barbs.

FIGURE 5-1
SURFACE GRADIENT TIGHTENS

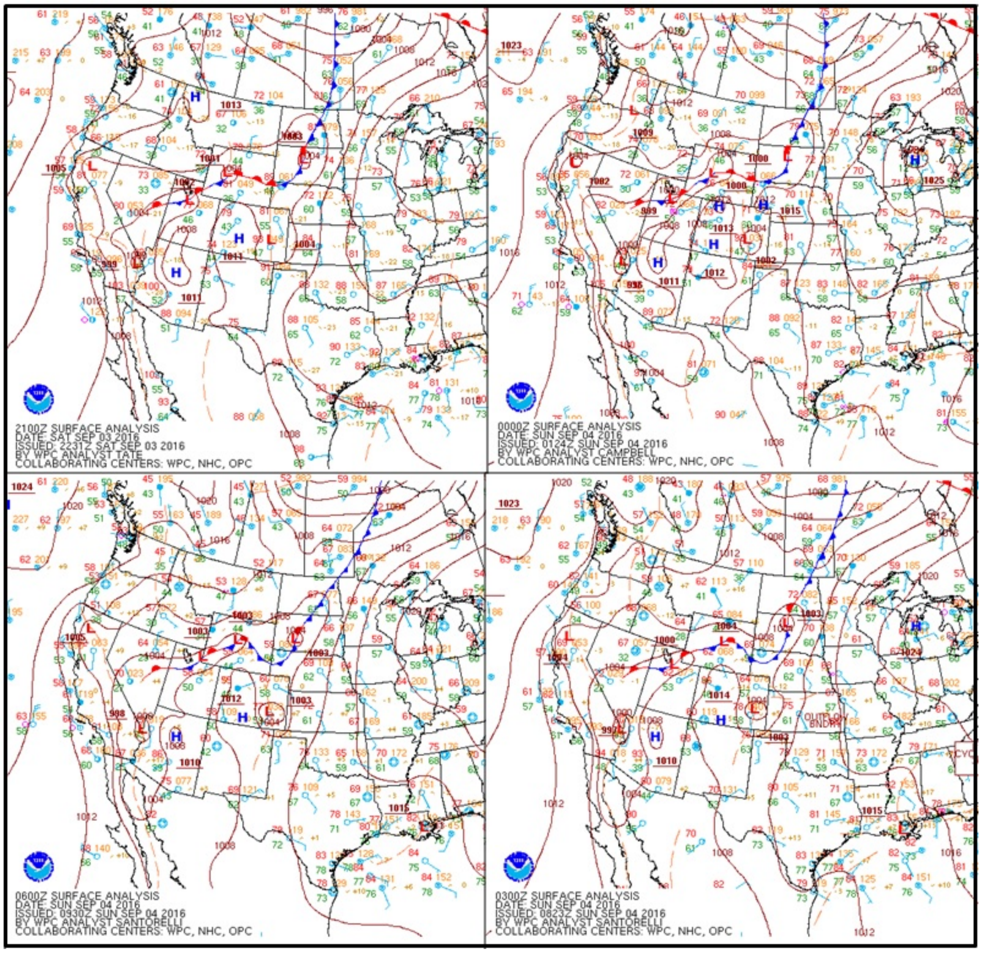


Fig 5-1: A quad of Surface Analysis Maps depicts the tightening of the surface gradient at 1300 PST (top left); 1600 PST (top right); 1900 PST (bottom right); 2200 PST (bottom left). The highest winds and gust occurred during the 1900 hour, which coincided with elevated hourly concentrations at all monitors. Source: WPC Surface Analysis Archive

FIGURE 5-2
GOES-W SATELLITE IMAGE WITH WIND BARBS

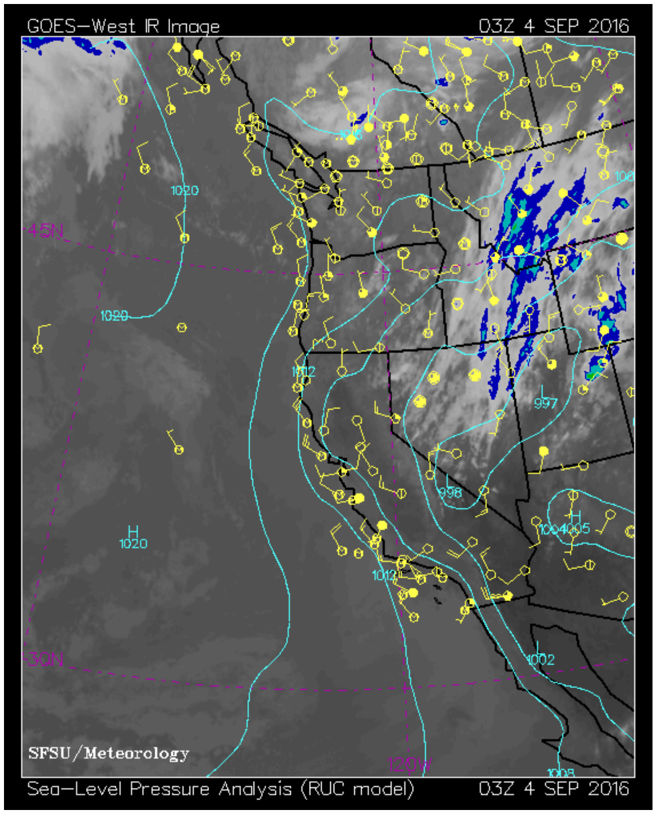


Fig 5-2: A GOES-W sea level pressure analysis image (1900 PST) on September 3, 2016 depicts wind barbs along with the symbol for haze at El Centro NAF (KNJK). A moderately packed surface gradient can also be seen in the image. The tightening of the gradient led to strong winds across southeastern California. Source: SFSU Department of Earth & Climates Sciences and the California Regional Weather Server; http://virga.sfsu.edu/crws/archive/wcsathts_arch.html

Figures 5-3 and Figure 5-4 are satellite images of aerosols drifting over Imperial County captured by the MODIS instrument onboard the Terra and Aqua satellites on September 3, 2016.[11] The right image on each utilizes the Deep Blue Aerosol Angstrom Exponent.[12] This is useful in showing

[11] **Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness)** indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov

[12] The MODIS **Deep Blue Aerosol Ångström Exponent** layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) https://worldview.earthdata.nasa.gov; The Ångström Exponent (denoted as AE or α) is a measure of how the AOD changes relative to the various wavelength of light (known as 'spectral dependence'.) This is

heavier aerosols that might indicate dust. Although both satellites made their pass prior to peak concentrations, it does support the existence of large-particle aerosols in the ambient air.

FIGURE 5-3
TERRA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY

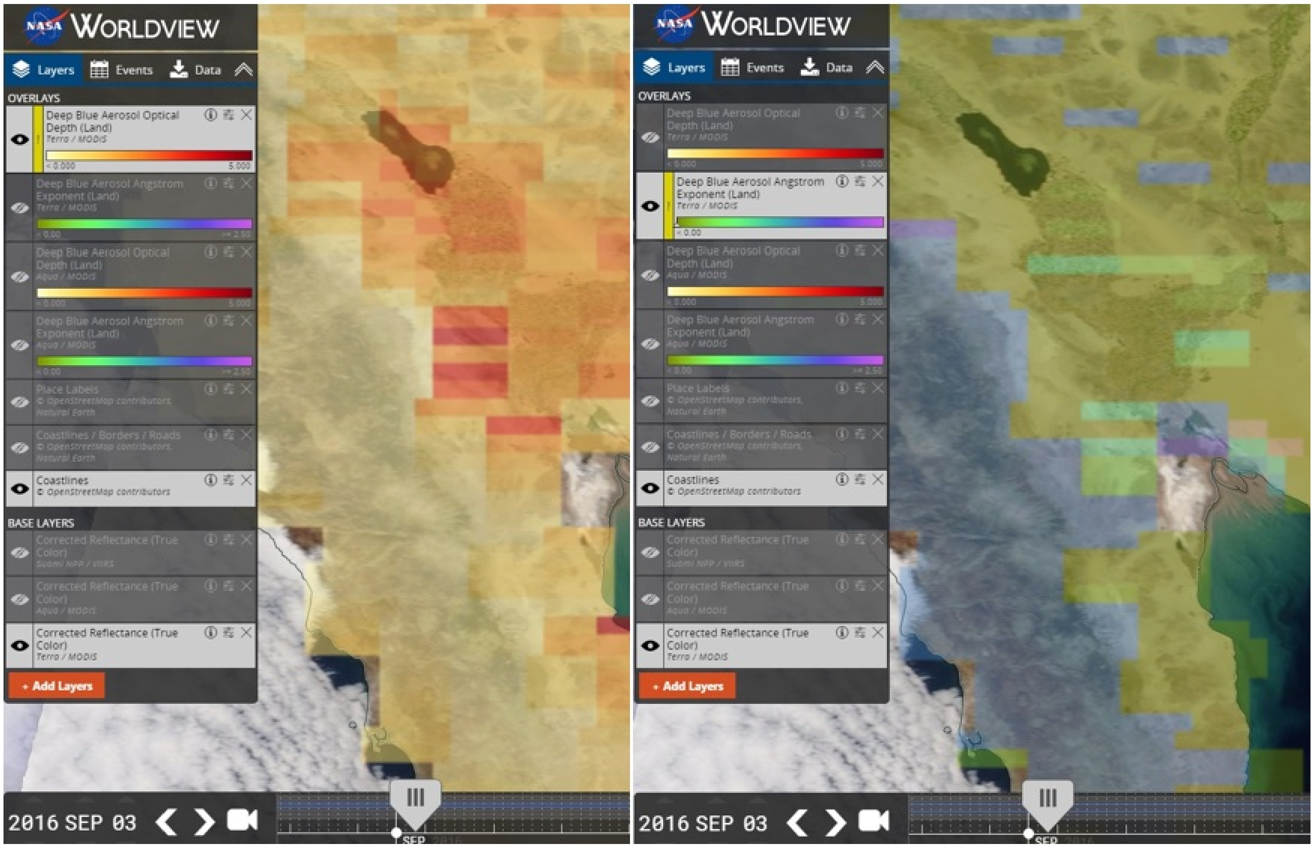


Fig 5-3: The MODIS instrument onboard the Terra satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~10:30 PST on September 3, 2016. Green colors (right image) indicate thicker aerosols that are more likely dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov.

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related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g. dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); https://deepblue.gsfc.nasa.gov/science

FIGURE 5-4
AQUA MODIS CAPTURES AEROSOLS OVER IMPERIAL COUNTY

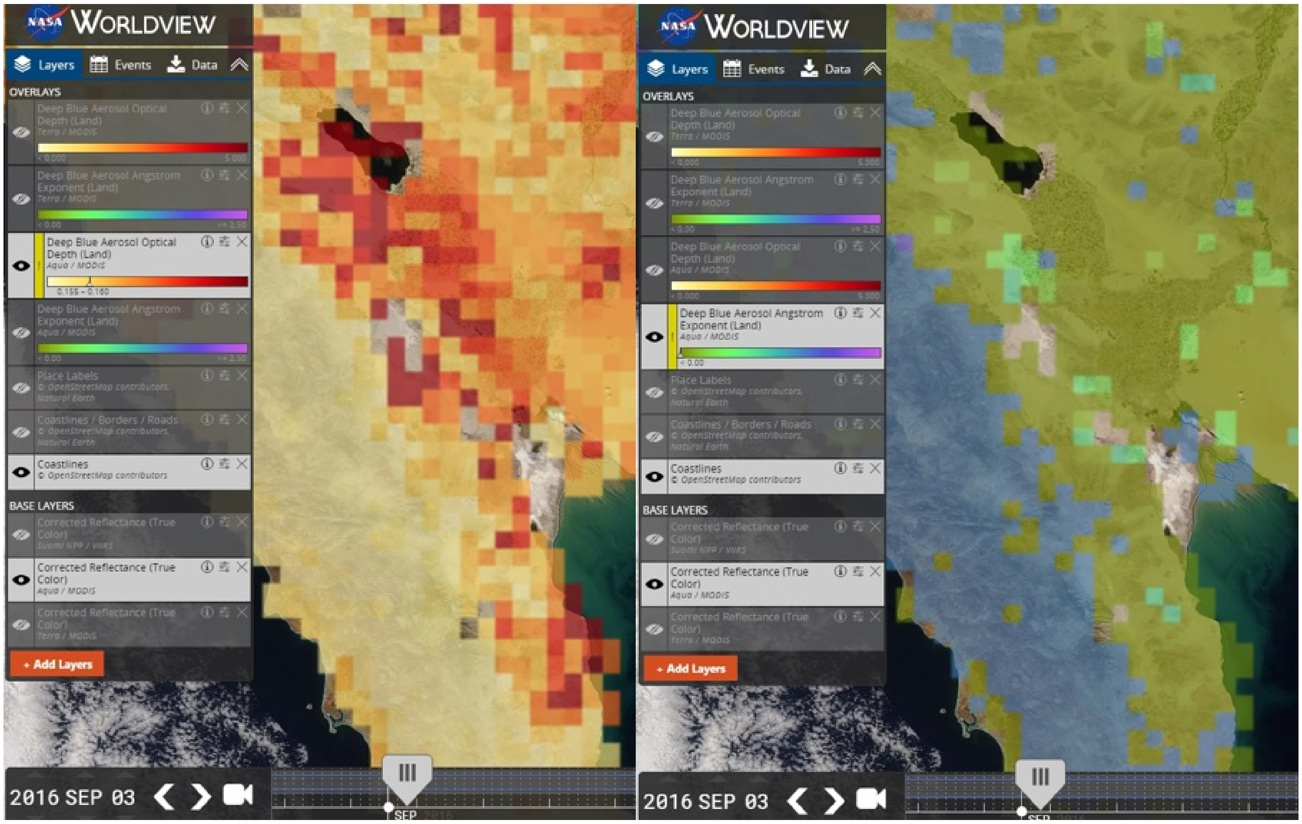

Fig. 5-4: The MODIS instrument onboard the Aqua satellite captured a thick layer of large particle aerosols drifting over Imperial County at ~13:30 PST on September 3. Green colors (right image) indicate thicker aerosols that are more likely dust. Source: NASA Worldview; https://worldview.earthdata.nasa.gov.

Entrained dust particles in the ambient air is also supported by the descriptive text narrative for smoke/dust observed and released by NOAA's Satellite Services (**Appendix A**). The description identified a patch of thin to moderately dense blowing dust originating after 1200 PST on September 3, 2016 from sources to the south of the Salton Sea, moving eastward over far southeastern California close to the border of southwestern Arizona. The descriptive text product also identified a second streak of thin to moderately dense blowing dust after 12:00pm PST from a source in far northwestern Mexico (well south of the Arizona border) moving eastward. The descriptive text product was effective through 1900 PST September 3, 2016. This is coincident with elevated wind speeds, gusts and concentrations of PM_{10}.

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[13] **Tables 5-1 through 5-3** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding monitors September 3, 2016.

[13] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

The tables show that peak hourly concentrations took place immediately following or during the period of high upstream wind speeds. Although the Brawley FRM monitor measured an exceedance of the NAAQS, it is very probable that the Brawley FEM monitor would have similarly exceeded the NAAQS had the monitor not failed critical criteria requirements for the hours of 18:00 and 19:00.

TABLE 5-1
UPSTREAM WIND SPEEDS AND BRAWLEY PM_{10} CONCENTRATIONS SEPTEMBER 3, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				BRAWLEY	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (µg/m³)
0:56	6		200	0:53	0		0	0:50	26	34	212	0:26	11	17	217	0:00	
1:56	7		200	1:53	6		160	1:50	23	33	214	1:26	14	20	211	1:00	32
2:56	6		160	2:53	5		150	2:50	24	35	216	2:26	9	23	221	2:00	22
3:56	3		160	3:53	5		150	3:50	26	34	209	3:26	9	15	198	3:00	29
4:56	0		0	4:53	6		160	4:50	29	37	212	4:26	9	13	204	4:00	32
5:56	3		160	5:53	0		0	5:50	27	39	208	5:26	5	10	186	5:00	35
6:56	3		280	6:53	3		100	6:50	28	37	209	6:26	9	11	190	6:00	41
7:56	5		230	7:53	3		220	7:50	26	40	213	7:26	6	14	163	7:00	32
8:56	0		0	8:53	5		20	8:50	20	36	211	8:26	5	10	193	8:00	27
9:56	0		0	9:53	0		0	9:50	20	30	213	9:26	4	9	212	9:00	31
10:56	6		170	10:53	3		240	10:50	17	29	216	10:26	6	12	357	10:00	19
11:56	3		190	11:53	0		0	11:50	17	30	211	11:26	10	17	180	11:00	22
12:56	5		160	12:53	3		VR	12:50	17	31	209	12:26	11	23	211	12:00	24
13:56	6		VR	13:53	7		300	13:50	20	31	232	13:26	17	31	198	13:00	29
14:56	7		VR	14:53			M	14:50	20	29	220	14:26	21	30	199	14:00	24
15:56	25		260	15:53	14	20	250	15:50	18	36	216	15:26	17	29	194	15:00	65
16:56	26		260	16:53	17	26	260	16:50	17	29	233	16:26	21	28	197	16:00	329
17:56	31	39	260	17:53	20	28	280	17:50	13	28	226	17:26	21	29	200	17:00	946
18:56	29	39	270	18:53	24	32	270	18:50	21	33	215	18:26	18	27	206	18:00	
19:56	36	43	270	19:53	29	41	280	19:50	32	44	210	19:26	15	24	208	19:00	
20:56	28		270	20:53	26	34	280	20:50	30	44	220	20:26	17	25	209	20:00	563
21:56	22		280	21:53	20	28	280	21:50	35	46	214	21:26	21	27	218	21:00	120
22:56	21		280	22:53	13		320	22:50	30	44	212	22:26	15	29	208	22:00	89
23:56	20		270	23:53	17		270	23:50	34	46	206	23:26	14	24	205	23:00	90

*Wind data for KNJK and KIPL from the NCEI's QCLCD system. Wind data for Mountain Springs Grade (TNSC1) and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Brawley station does not record wind data. Wind speeds = mph; Direction = degrees

TABLE 5-2
UPSTREAM WIND SPEEDS AND EL CENTRO PM_{10} CONCENTRATIONS SEPTEMBER 3, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				SUNRISE-OCOTILLO (IMPSD)				EL CENTRO	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} ($\mu g/m^3$)
0:56	6		200	0:53	0		0	0:50	26	34	212	0:00	12	20	226	0:00	25
1:56	7		200	1:53	6		160	1:50	23	33	214	1:00	15	21	230	1:00	30
2:56	6		160	2:53	5		150	2:50	24	35	216	2:00	8	13	206	2:00	32
3:56	3		160	3:53	5		150	3:50	26	34	209	3:00	9	21	264	3:00	20
4:56	0		0	4:53	6		160	4:50	29	37	212	4:00	7	12	219	4:00	25
5:56	3		160	5:53	0		0	5:50	27	39	208	5:00	2	5	205	5:00	29
6:56	3		280	6:53	3		100	6:50	28	37	209	6:00	1	4	156	6:00	40
7:56	5		230	7:53	3		220	7:50	26	40	213	7:00	5	9	244	7:00	36
8:56	0		0	8:53	5		20	8:50	20	36	211	8:00	14	19	211	8:00	31
9:56	0		0	9:53	0		0	9:50	20	30	213	9:00	12	19	222	9:00	35
10:56	6		170	10:53	3		240	10:50	17	29	216	10:00	9	16	248	10:00	21
11:56	3		190	11:53	0		0	11:50	17	30	211	11:00	10	17	235	11:00	24
12:56	5		160	12:53	3		VR	12:50	17	31	209	12:00	17	25	237	12:00	32
13:56	6		VR	13:53	7		300	13:50	20	31	232	13:00	14	24	266	13:00	26
14:56	7		VR	14:53			M	14:50	20	29	220	14:00	13	21	260	14:00	27
15:56	25		260	15:53	14	20	250	15:50	18	36	216	15:00	11	20	260	15:00	66
16:56	26		260	16:53	17	26	260	16:50	17	29	233	16:00	16	25	240	16:00	455
17:56	31	39	260	17:53	20	28	280	17:50	13	28	226	17:00	11	20	259	17:00	689
18:56	29	39	270	18:53	24	32	270	18:50	21	33	215	18:10	26	38	247	18:00	711
19:56	36	43	270	19:53	29	41	280	19:50	32	44	210	19:40	26	37	244	19:00	858
20:56	28		270	20:53	26	34	280	20:50	30	44	220	20:00	14	24	264	20:00	695
21:56	22		280	21:53	20	28	280	21:50	35	46	214	21:00	25	36	236	21:00	187
22:56	21		280	22:53	13		320	22:50	30	44	212	22:00	25	36	231	22:00	58
23:56	20		270	23:53	17		270	23:50	34	46	206	23:00	20	40	249	23:00	46

*Wind data for KNJK and KIPL from the NCEI's QCLCD system. Wind data for Mountain Springs Grade (TNSC1) and Sunrise-Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees.

TABLE 5-3
UPSTREAM WIND SPEEDS AND WESTMORLAND PM_{10} CONCENTRATIONS SEPTEMBER 3, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				WESTMORLAND	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (µg/m³)
0:56	6		200	0:53	0		0	0:50	26	34	212	0:26	11	17	217	0:00	39
1:56	7		200	1:53	6		160	1:50	23	33	214	1:26	14	20	211	1:00	25
2:56	6		160	2:53	5		150	2:50	24	35	216	2:26	9	23	221	2:00	25
3:56	3		160	3:53	5		150	3:50	26	34	209	3:26	9	15	198	3:00	19
4:56	0		0	4:53	6		160	4:50	29	37	212	4:26	9	13	204	4:00	14
5:56	3		160	5:53	0		0	5:50	27	39	208	5:26	5	10	186	5:00	48
6:56	3		280	6:53	3		100	6:50	28	37	209	6:26	9	11	190	6:00	72
7:56	5		230	7:53	3		220	7:50	26	40	213	7:26	6	14	163	7:00	44
8:56	0		0	8:53	5		20	8:50	20	36	211	8:26	5	10	193	8:00	26
9:56	0		0	9:53	0		0	9:50	20	30	213	9:26	4	9	212	9:00	41
10:56	6		170	10:53	3		240	10:50	17	29	216	10:26	6	12	357	10:00	19
11:56	3		190	11:53	0		0	11:50	17	30	211	11:26	10	17	180	11:00	25
12:56	5		160	12:53	3		VR	12:50	17	31	209	12:26	11	23	211	12:00	26
13:56	6		VR	13:53	7		300	13:50	20	31	232	13:26	17	31	198	13:00	25
14:56	7		VR	14:53			M	14:50	20	29	220	14:26	21	30	199	14:00	24
15:56	25		260	15:53	14	20	250	15:50	18	36	216	15:26	17	29	194	15:00	340
16:56	26		260	16:53	17	26	260	16:50	17	29	233	16:26	21	28	197	16:00	627
17:56	31	39	260	17:53	20	28	280	17:50	13	28	226	17:26	21	29	200	17:00	995
18:56	29	39	270	18:53	24	32	270	18:50	21	33	215	18:26	18	27	206	18:00	995
19:56	36	43	270	19:53	29	41	280	19:50	32	44	210	19:26	15	24	208	19:00	768
20:56	28		270	20:53	26	34	280	20:50	30	44	220	20:26	17	25	209	20:00	267
21:56	22		280	21:53	20	28	280	21:50	35	46	214	21:26	21	27	218	21:00	164
22:56	21		280	22:53	13		320	22:50	30	44	212	22:26	15	29	208	22:00	153
23:56	20		270	23:53	17		270	23:50	34	46	206	23:26	14	24	205	23:00	81

*Wind data for KNJK and KIPL from the NCEI's QCLCD system. Wind data for Mountain Springs Grade (TNSC1) and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees.

Figure 5-5 is a graphic depiction that combines the HYSPLIT trajectory, upstream wind speeds, and significant coincident peak concentration times. The trajectory ends at 1900 PST on September 3, 2016 which corresponds to the hourly measured peak concentration at the El Centro monitor and while not the hourly measured peak concentration at the Westmorland monitor it follows two measured consecutive peak concentrations. Westmorland measured elevated concentrations of PM_{10} one hour prior to all the remaining four monitors. Measured hourly peak concentrations at Calexico, Brawley, and Niland at 18:00 PST, 17:00 PST and 19:00 PST respectively.

As mentioned above, meteorological observations indicated that winds were primarily southwest to west with highest elevated wind speeds during the afternoon and evening hours of September 3, 2016. All monitors measured elevated concentrations however as winds remained primarily southwest both the Calexico and Niland monitors, located further east were less affected. Essentially, the event significantly affected monitors that were much more centralized and in-line with open natural areas.

Both the Niland and Calexico monitors measured a wind direction predominantly east-southeast with low wind speeds prior to the 13:00 PST hour and 09:00 PST hour, respectively. However, unlike the Niland monitor which measured a westerly wind direction and elevated wind speeds after the 13:00 PST hour the Calexico monitor measured a predominantly northwest wind direction and lower wind speeds after the 09:00 PST hour. Location of the monitors created the ideal conditions for reduced saltation and suspension of particulates at both monitors. Because upper air influences can differ from surface influences, the predominantly northwest direction measured by the Calexico monitor allowed for less saltation and suspension of particulates when winds blew over a larger developed area, with applied BACM, thus causing the monitor to measure the lowest 24-hour average. Although gusty westerly winds passed over the southern portion of the Salton Sea, affecting the Niland monitor, reduced saltation and suspension of particulates allowed for a measured 24-hour concentration at the Niland monitor below the NAAQS.

FIGURE 5-5
TIMELINE OF ENTRAINMENT SEPTEMBER 3, 2016

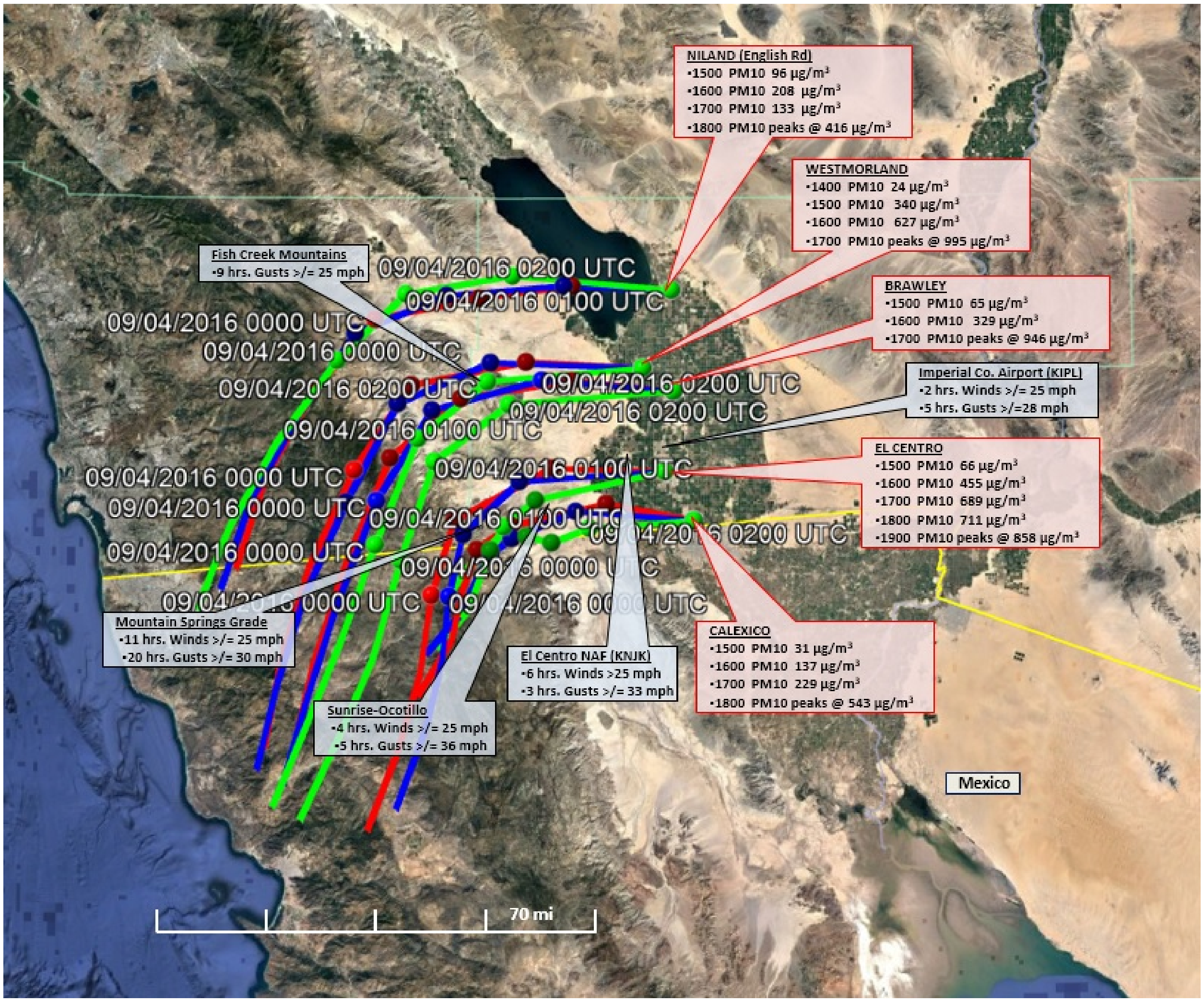

Fig 5-5: A six-hour HYSPLIT trajectory with wind speeds and PM_{10} concentrations. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth. Base map from Google Earth

Figures 5-6 through 5-10 depict PM_{10} concentrations and wind speeds over a 72-hour period at Brawley, El Centro, and Westmorland. Fluctuations in hourly concentrations at the monitors over 72 hours show a positive correlation with wind speeds and gusts at upstream sites.

FIGURE 5-6
BRAWLEY PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

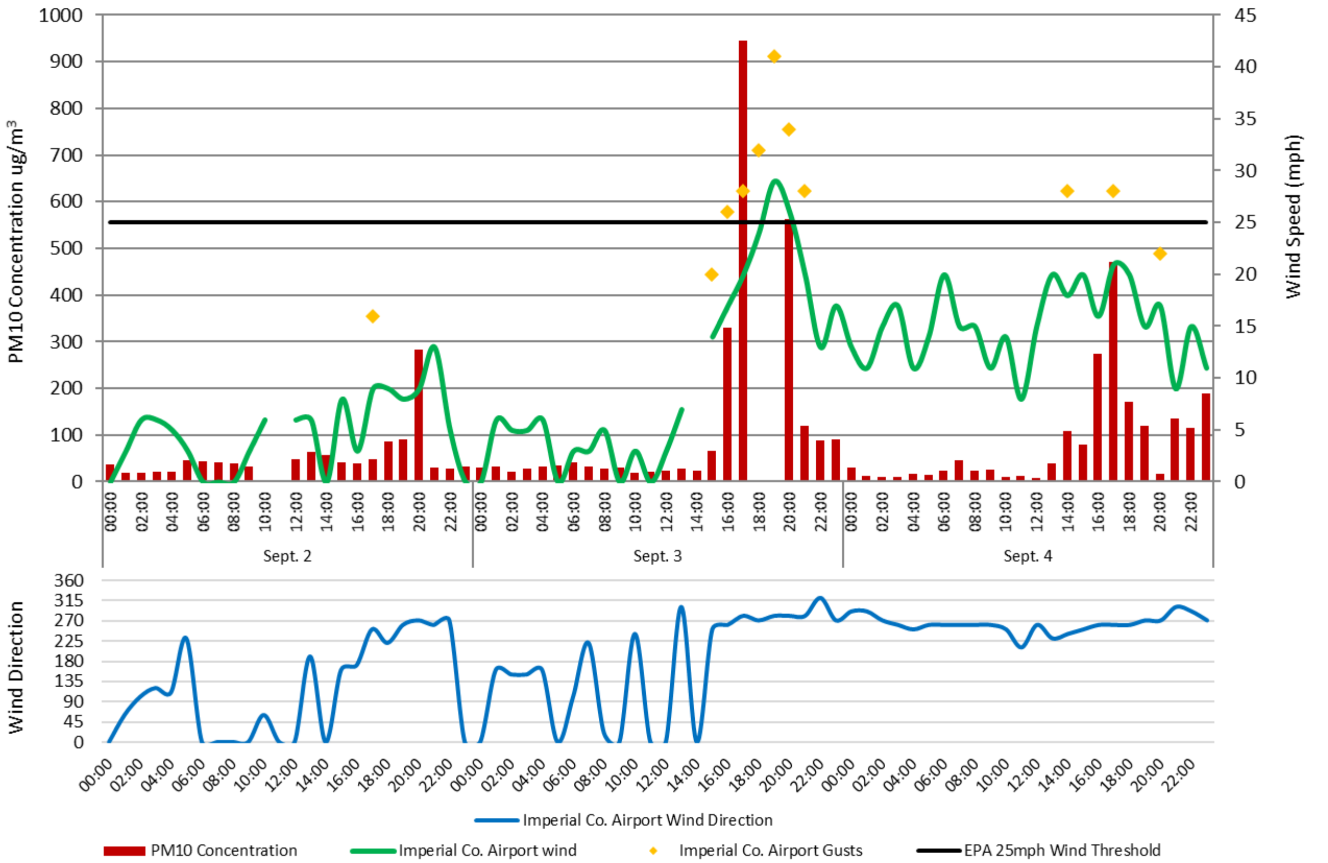

Fig 5-6: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL). Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-7
EL CENTRO PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

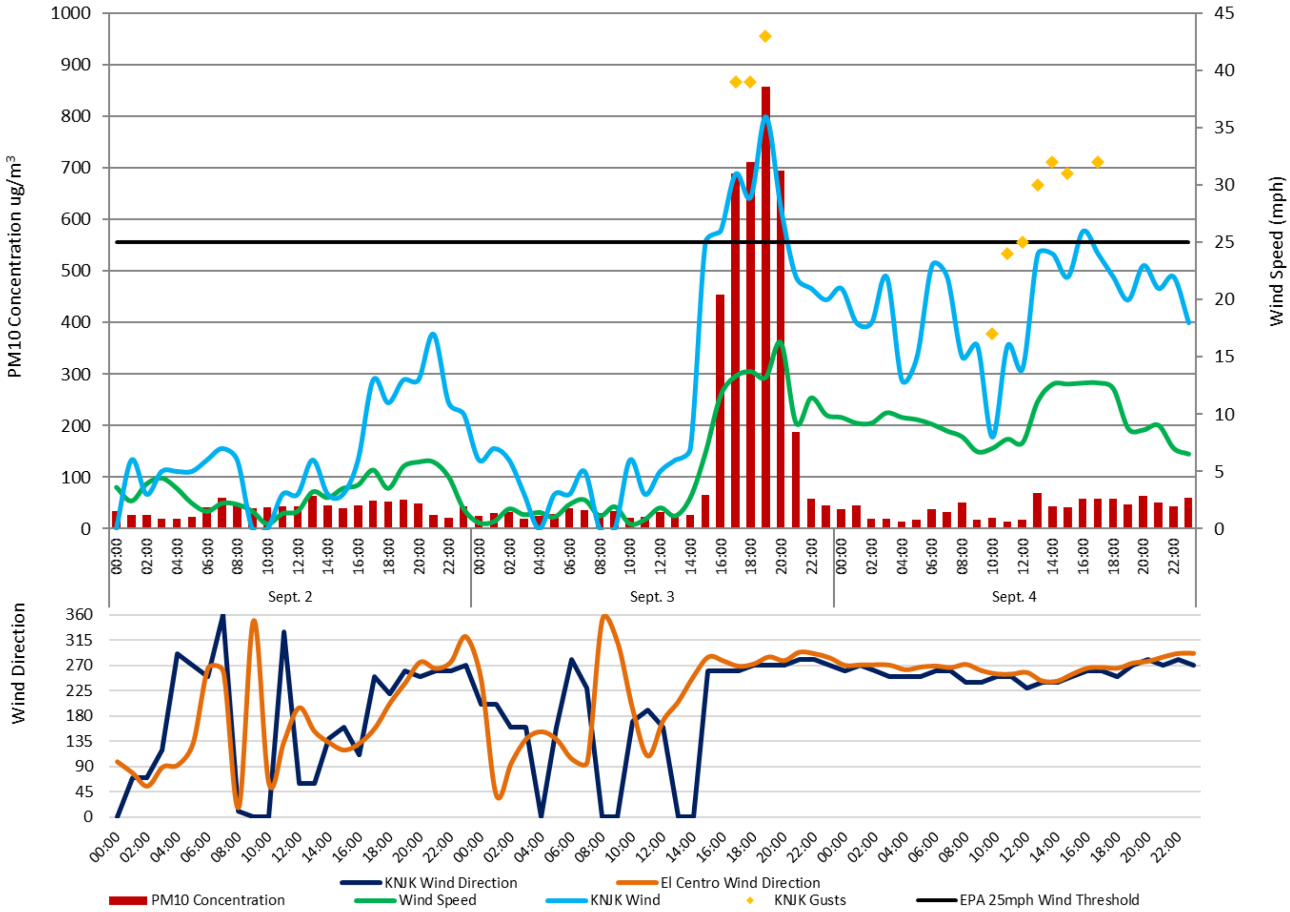

Fig 5-7: Upstream winds at El Centro NAF surpassed the 25 mph threshold, while winds at El Centro did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-8
WESTMORLAND PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

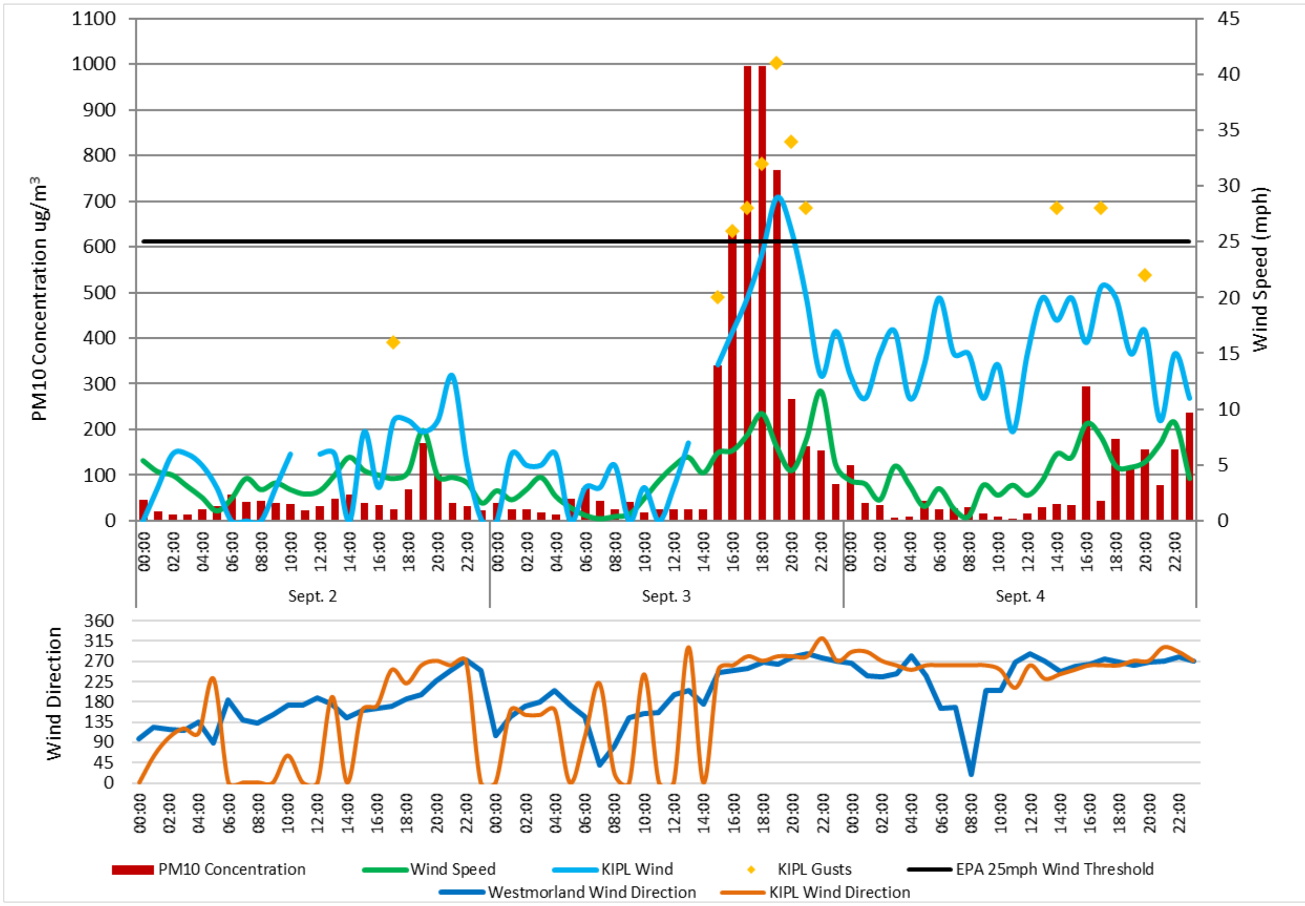

Fig 5-8: Upstream winds at Imperial County Airport surpassed the 25 mph wind threshold, while winds at Westmorland did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-9 depicts the relationship between the 72-hour PM_{10} fluctuations by the Brawley, Calexico, El Centro, Niland, and Westmorland monitors together with upstream wind speeds. A positive correlation can be seen, between an increase in wind speeds and gusts with increased concentrations at the monitors. **Appendix C** contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-9
PM10 CONCENTRATIONS & UPSTREAM WIND SPEED CORRELATIONS

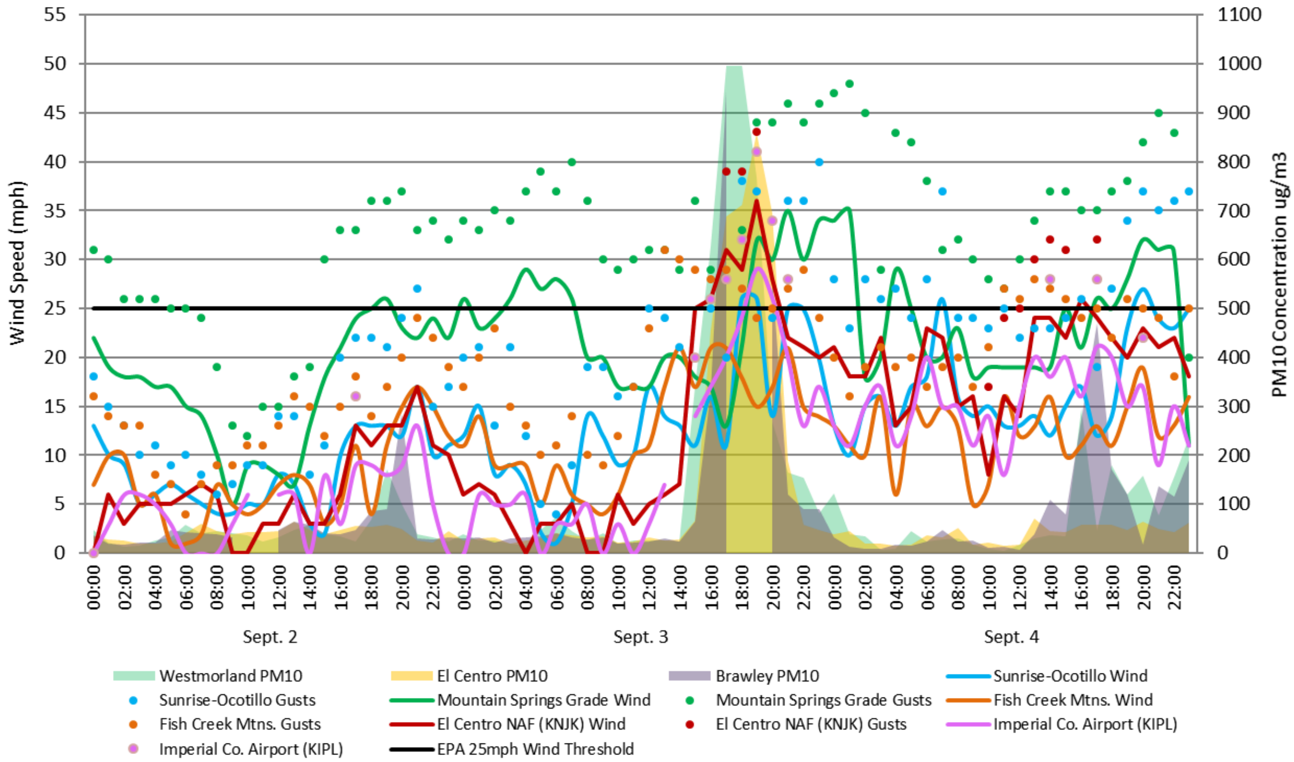

Fig 5-9: This graph depicts the 72-hour PM_{10} fluctuations by the Brawley, El Centro, and Westmorland monitors together with upstream wind speeds. A positive correlation between an increase in wind speeds can be seen, particularly with gusts. Black line indicates the 25 mph threshold.

Figure 5-10 compares the 72-hour concentrations at Brawley, Calexico, El Centro, Westmorland, and Niland with visibility[14] at local airports between September 2, 2016 and September 4, 2016. Generally, drops in visibility correspond to highest hourly concentrations at the monitors.

[14] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm.

FIGURE 5-10
72-HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

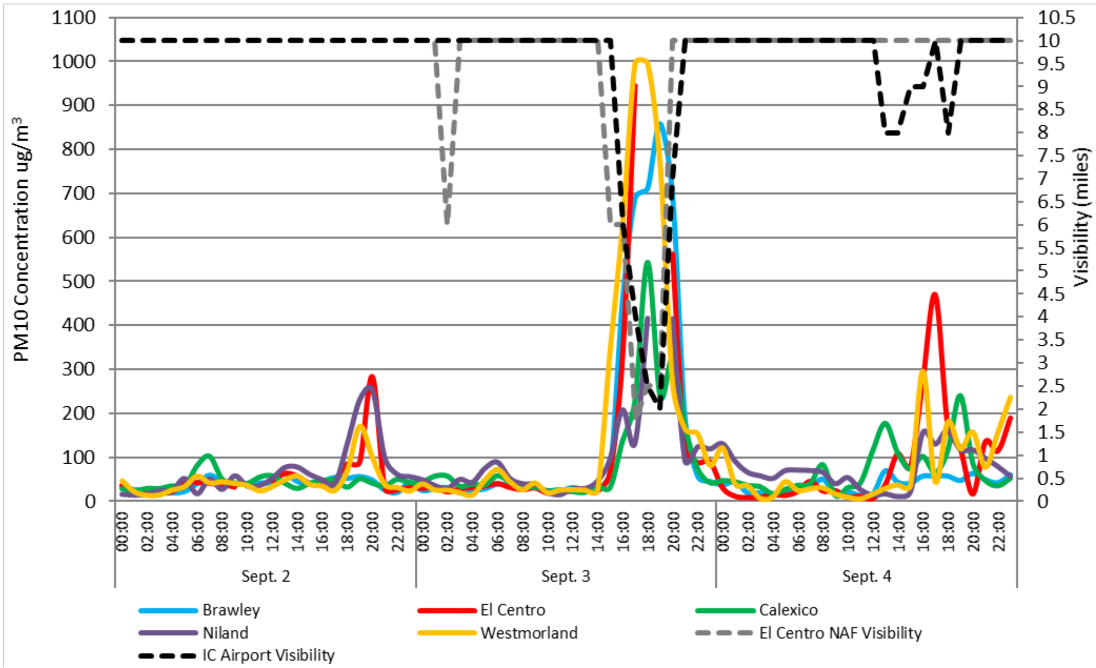

Fig 5-10: Visibility as measured from the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) show that visibility reduced significantly at the airports coincident to peak concentrations at Brawley, Calexico, El Centro, Niland, and Westmorland. Visibility data from the NCEI's QCLCD data bank

Entrained windblown dust from natural areas affected air quality in Imperial County on September 3, 2016. **Figures 5-11 through 5-13** are the resulting air quality indices[15] in Brawley, El Centro, and Westmorland during September 3, 2016 due to windblown dust entrained into Imperial County by the high winds. At Brawley (**Figure 5-11**) air quality remained in the "Green" or Good category (PM10 0-50 µg/m^3) until entering the "Yellow" or Moderate level (PM10 51-100 µg/m^3) at 6 p.m. where it remained for the duration of the day. At El Centro (**Figure 5-12**) air quality remained in the "Green" or Good category (PM10 0-50 µg/m^3) until entering the "Yellow" or Moderate level (PM10 51-100 µg/m^3) at 7 p.m. At 10 p.m. air quality dropped to the "Orange" or Unhealthy for Sensitive Groups level (PM10 101-150 µg/m^3) at 10 p.m. where it remained through the day. At Westmorland (**Figure 5-13**) air quality remained in the "Green" or Good category (PM10 0-50 µg/m^3) until entering the "Yellow" or Moderate level (PM10 51-100 µg/m^3) at 7 p.m. At 10 p.m. air quality dropped to the "Orange" or Unhealthy for Sensitive Groups

[15] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://www.airnow.gov/index.cfm?action=aqibasics.aqi

level (PM10 101-150 µg/m^3) at 10 p.m. where it remained for the rest of the day. **Appendix A** contains copies of notices pertinent to the September 3, 2016 event.

FIGURE 5-11
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
SEPTEMBER 3, 2016

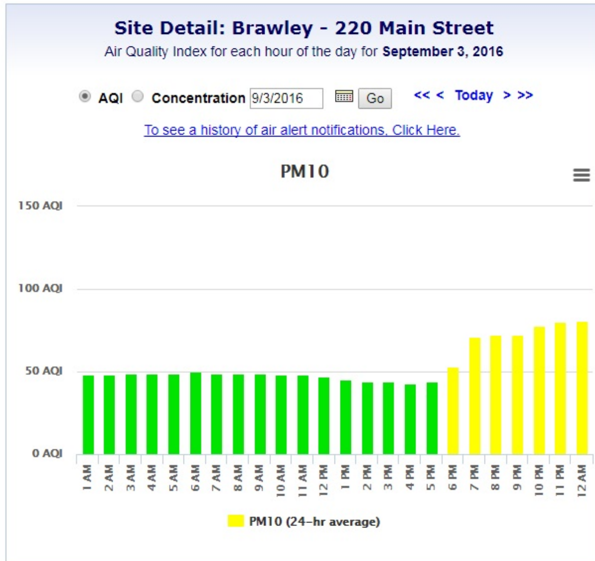

Fig 5-11: The reduced air quality in Brawley shows that the fugitive dust lofted by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-12
IMPERIAL VALLEY AIR QUALITY INDEX IN EL CENTRO
SEPTEMBER 3, 2016

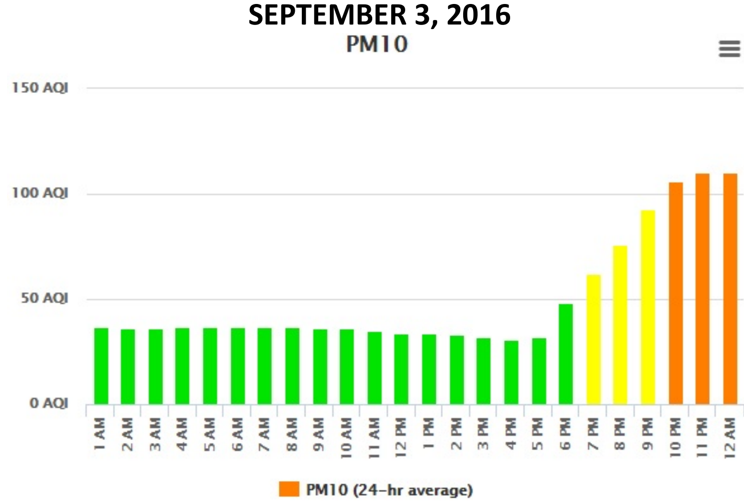

Fig 5-12: The reduced air quality in El Centro shows that the fugitive dust lofted by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-13
IMPERIAL VALLEY AIR QUALITY INDEX IN WESTMORLAND
SEPTEMBER 3, 2016

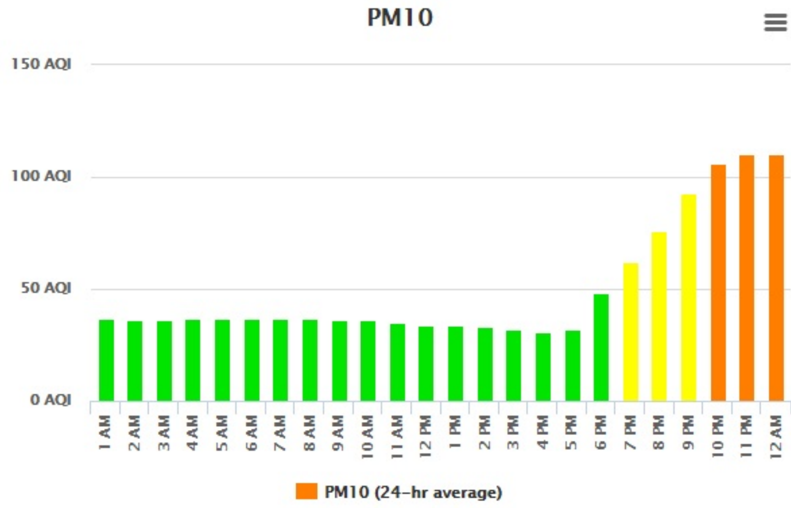

Fig 5-13: The reduced air quality in Westmorland shows that the fugitive dust lofted by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the gusty westerly winds associated with the low-pressure trough that moved through California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley, El Centro, and Westmorland monitors on September 3, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego, northwest Mexico, and Imperial County. Large amounts of coarse particles (dust) and PM_{10} transported by gusty westerly winds into the lower atmosphere caused a change in the air quality conditions within Imperial County. The entrained windblown dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on September 3, 2016 coincided with high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-14
SEPTEMBER 3, 2016 WIND EVENT TAKEAWAY POINTS

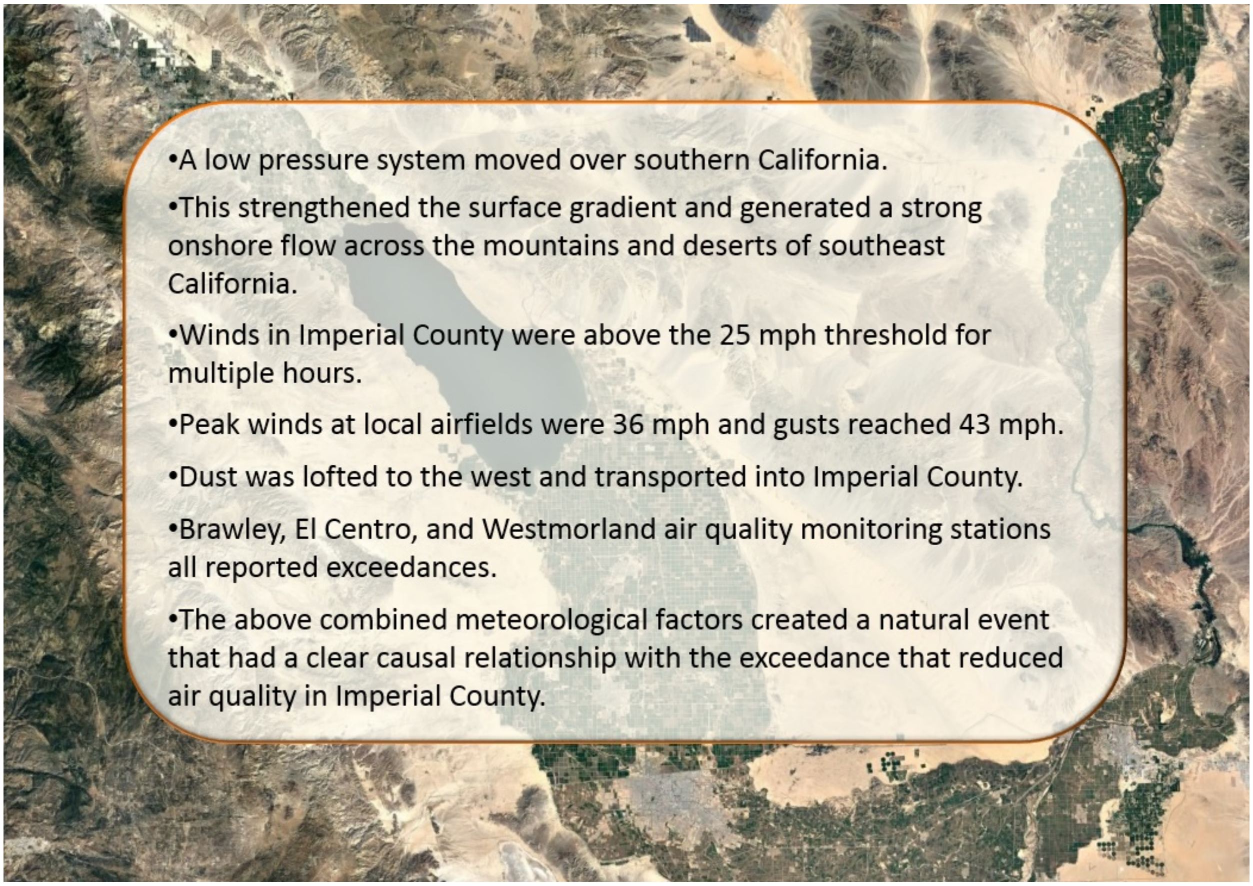

Fig 5-14: Illustrates the factors that qualify the September 3, 2016 natural event which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on September 3, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-30; 68
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	49-66; 67
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	31-41; 68
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	42-48; 67
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	49-66; 67

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the September 3, 2016 event which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played litter or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley, El Centro, and Westmorland monitors were caused by naturally occurring gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that the PM_{10} exceedances at Brawley, El Centro, and Westmorland on September 3, 2016 were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50), which may recur at the same location, is an event where human activity plays little or no direct causal role. The event, along with its resulting emissions and reasonably controlled anthropogenic sources considered not playing a direct role in causing the emissions, meets the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM_{10} exceedances that occurred at Brawley, El Centro, and Westmorland on September 3, 2016, were caused by the transport of windblown dust into Imperial County by gusty westerly winds associated with the passage of a trough of low-pressure that moved through California. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley, El Centro, and Westmorland during different days, and the comparative analysis of different areas in Imperial, Riverside and Yuma counties, demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} at the Brawley, El Centro, and Westmorland monitors on September 3, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds qualified as an event that was regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on September 3, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley, El Centro, and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains forecasts issued by the National Weather Service and Imperial County on or around September 3, 2016. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.